



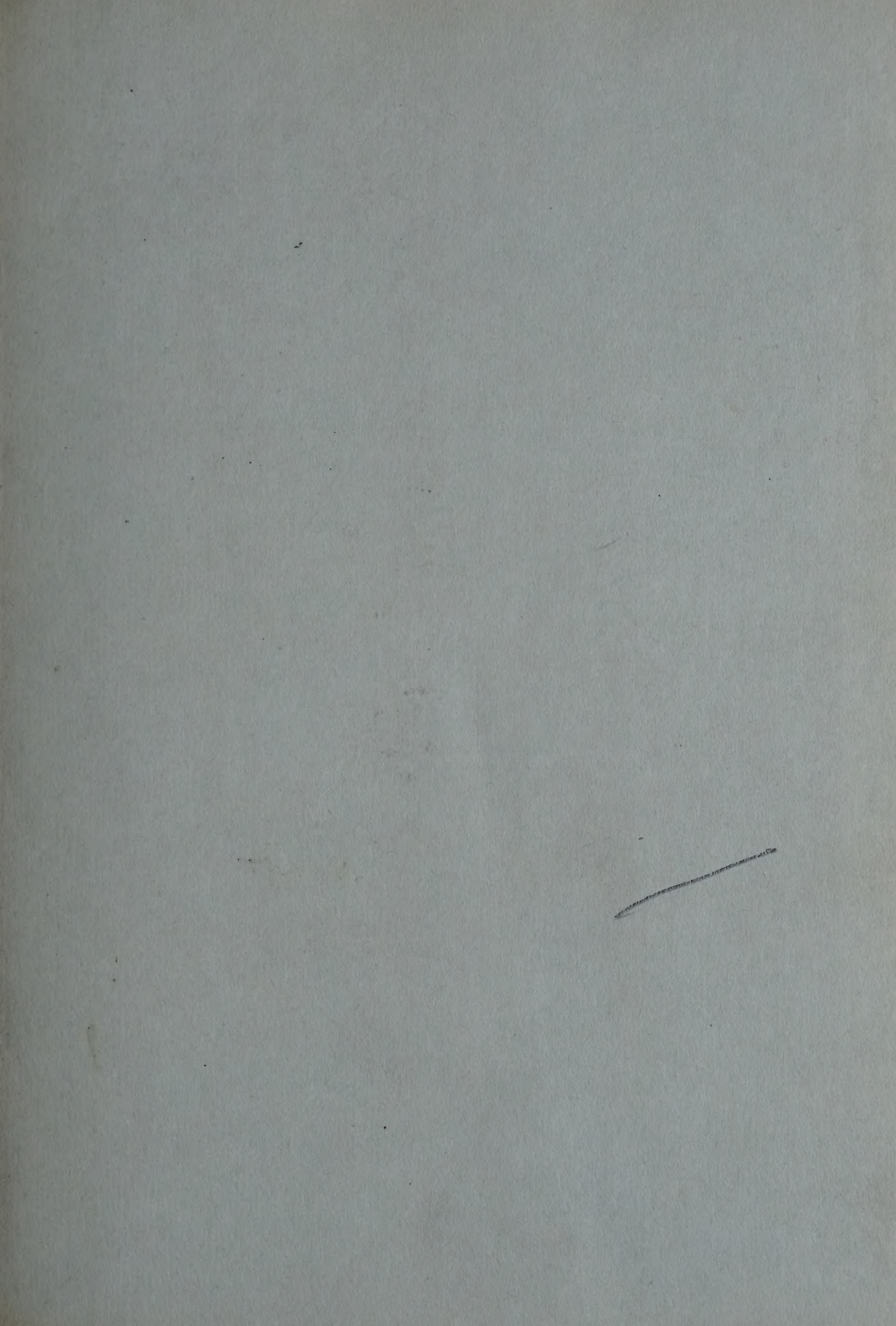


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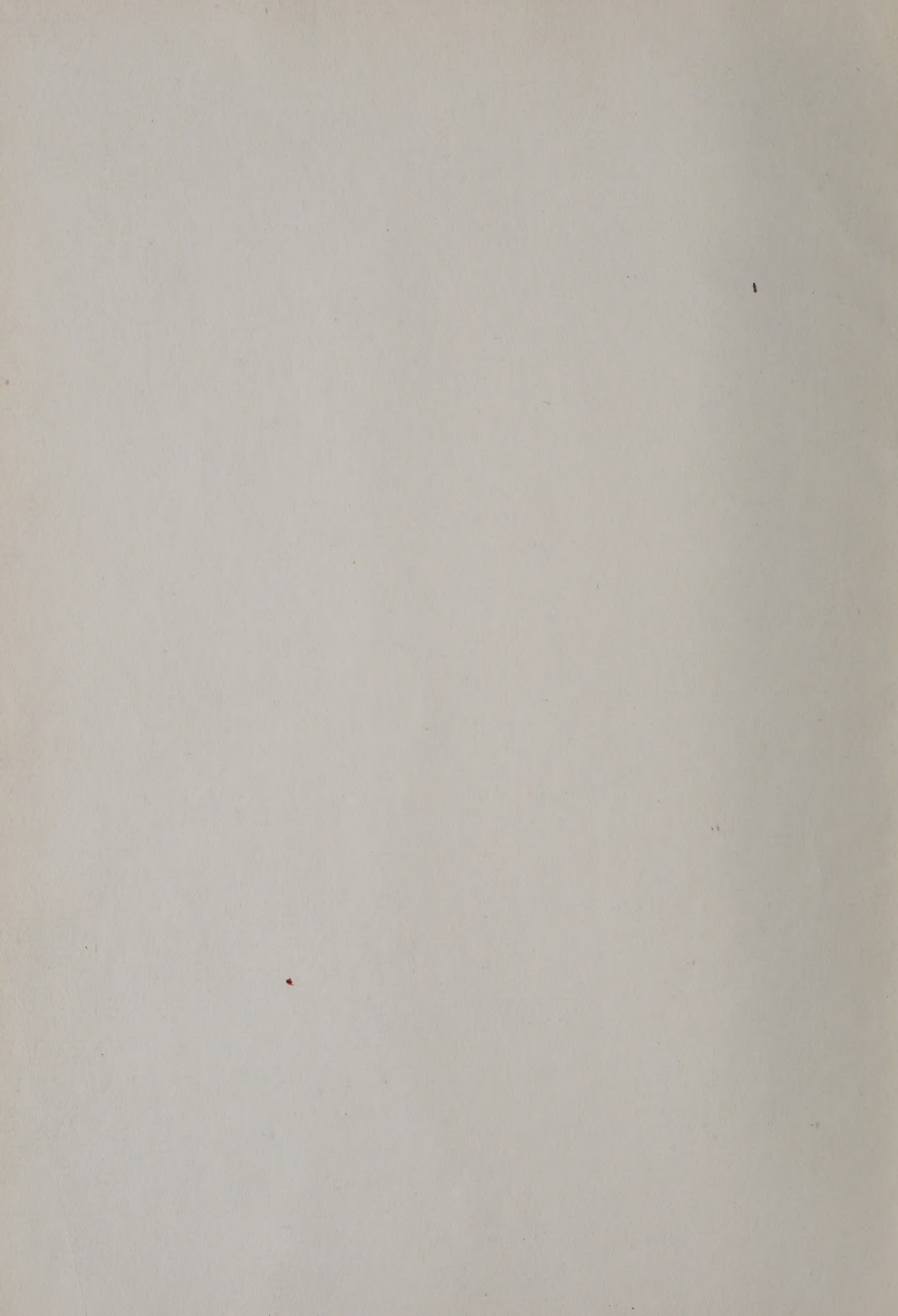


















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FRENCH ARCHITECTURE  
From XI to XVI Centuries

By

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From Palais to Puits

PARIS

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## PALACE. Palace.

Houses of kings or sovereigns, the place where the sovereign resided. Thus what particularly distinguishes the palace from the basilica, the great hall that is always the principal part. In the middle ages the palace after the Carolingians is situated in the capital of the sovereign, and is his residence until about the 14th century. Yet the Merovingian kings possessed palaces in the country or near the cities. Those first palaces were nearly erected on the model of the Gallo-Roman villas, even sometimes in the ruins of those establishments. The palaces of Verberie, Compiègne, Chelles, Noisy, Braine, Athisny, were only actual villas. "The royal habitation had nothing of the military appearance of the castles of the middle ages; it was a vast building surrounded by portions of Roman architecture, sometimes built of wood polished with care, and ornamented by sculptures, that did not lack elegance. Around the principal building were arranged in order the lodgings of the officers of the palace, either barbaric or Roman in origin, and those of the chiefs of the band, that according to the Germanic custom were in the trust of the king, together with their warriors, i.e., a number of families, whose men and women practised all sorts of trades. Most of these families were Gallic, born on the portion of the soil that the king had assigned to himself as part of the conquest, or transferred by force from some neighboring cities to colonize the royal domain; but if one judges of them by the appearance of their proper names, there were also among them Germans and other barbarians, whose fathers came into Gaul as workmen or servants, with the conquering bands. Besides, whatever their origin or their kind of industry, these families were placed in the same rank and designated by the same name, by that of "vassals" in the Teutonic tongue, or that of "fiscals" in Latin, i.e., attached to the fisc. Buildings for farming and breeding, stables, sheepfolds and barns, novels of laborers and huts of serfs of the domain, completed the royal village, that perfectly resembled the villages of ancient Germany, though on a larger scale. Live hedges, walls of dry stones and ditches, surrounded the entire group of buildings.



## PALAIS. Palace.

House of king or sovereign, the place where the sovereign renders justice. Thus what particularly distinguishes the palace from the basilica, the great hall that in fact is always the principal part. In the middle ages the palace after the Carlovingians is situated in the capital of the sovereign, and is his residence until about the 14<sup>th</sup> century. Yet the Merovingian kings possessed palaces in the country or near the cities. Those first palaces were nearly erected on the model of the Gallo-Roman villas, even sometimes in the ruins of those establishments. The palaces of Verberie, Compeigne, Chelles, Noisy, Braisne, Attigny, were only actual villas.

"The royal habitation had nothing of the military appearance of the castles of the middle ages; it was a vast building surrounded by porticos of Roman architecture, sometimes built of wood polished with care, and ornamented by sculptures, that did not lack elegance. Around the principal building were arranged in order the lodgings of the officers of the palace, either barbaric or Roman in origin, and those of the chiefs of the band, that according to the Germanic custom were in the trust of the king, together with their warriors, i.e., under the special agreement of vassalage and fidelity. Other houses of less important appearance were occupied by a great number of families, whose men and women practised all sorts of trades. Most of these families were Gaulish, born on the portion of the soil that the king had assigned to himself as part of the conquest, or transferred by force from some neighboring cities to colonize the royal domain; but if one judges of them by the appearance of their proper names, there were also among them Germans and other barbarians, whose fathers came into Gaul as workmen or servants, with the conquering bands. Besides, whatever their origin or their kind of industry, those families were placed in the same rank and designated by the same name, by that of "lites" in the Teutonic tongue, or that of "fiscalins," i.e., <sup>in Latin</sup> attached to the fisc. Buildings for farming and breeding, stables, sheepfolds and barns, hovels of laborers and huts of serfs of the domain, completed the royal village, that perfectly resembled the villages of ancient Germany, though on a larger scale."<sup>1</sup> Live hedges, walls of dry stones and ditches, surrounded the entire group of bu-







buildings, and formed several enclosures, according to the custom of the peoples of the North. The architecture of the buildings partook of the various influences under which they had been erected; it was a mixture of Gallo-Roman traditions and wooden structures built with a certain art, painted in brilliant colors. Barns, sheds, enormous cellars, contained provisions accumulated during several months, and that the barbaric princes desired to consume with their vassals. When all were exhausted, they transferred into another domain. These palaces were erected on the borders of great forests, echoing with the cries of the hunters and the tumults of orgies, often prolonged for several days. The Carolingians also retained that custom of living in country palaces, and Charlemagne possessed them in great number.<sup>2</sup> But then life in common was replaced by a sort of etiquette; the palace resembled more the court; beautiful gardens surrounded it, cultivated with care; the enclosures were more prominent. yet great hall or basilica always formed the principal part of the manor. Here (1) is a view of the entirety of a Carolingian palace. Charlemagne caused to be entirely rebuilt the palace of Verberie near Compeigne. Numerous fragments of it still remained in the last (18 th) century, if one credits Father Carlier.<sup>3</sup> According to that author, Charlemagne had built the tower of the Proedium, i.e., the keep dominating the domain, a tower whose substructures were still visible in his time. He also caused the building of the principal building, "an immense edifice," as well as the chapel of the palace, which "still retained the name of chapel Charlemagne in the 14 th century."

Note 1.p.2. Recit des temps merovingiens, by Augustin Thierry. Recit 1.

Note 2.p.2. Charlemagne also had palaces in the cities, among others that at Aix-la-Chapelle, which passed as very beautiful. (Old French poem). (La Chanson des Saxons. chap. 50).

Note 3.p.2. Hist. du duche de Valois, by Father Corlier, p prior of Andrezey. 1764. Vol. I. Book 2, p. 169.

"That palace," says father carlier, "had several dependances, that formed many separate castles, each of which had its purpose. The palace of Verberie had its outlook to the South; the edifices composing it extended from West to East on a line of 1536 ft. A very vast main building, in which were held general

entirely different from the other buildings at the West, like the  
chapel at the East. The chapel and assembly hall had four  
and two wings, that accompanied a long series of corridors of  
different forms and sizes. At the middle of each corridor and  
at the end of each wing were small rooms, some of which were  
used of two great stories. I have taken these notes," says  
Gardner, "from some remains of the ancient palace and from a  
document of the reign of Francis I, that describes the demolition  
of the different parts of the palace. These portions of  
the buildings had been burned under the unfortunate reign of  
Francis II."

It was only after the invasion of the Ukraine, that these  
resistance were converted into fortresses, constituting  
the backbone of the German defense.

[illegible]



assemblies, ~~aparliaments~~, councils, etc., the mallobergium,<sup>1</sup> terminated that series of buildings at the West, like the chapel at the East. The chapel and assembly hall thus formed two wings, that accompanied a long series of edifices of different forms and sizes. At the middle of that entire extent appeared a magnificent building of excessive height, composed of two great stories. I have taken these notes," adds Carlier, "from some remains of the ancient palace and from a document of the reign of Francis I, that permits the demolition of the different parts of the palace. Those portions of the buildings had been burned under the unfortunate reign of Charles VI earlier."

Note 1.p.3. Mallobergium, wolbergium, house of pleas, where justice was done. (See Duconge, Glossaire).

It was only after the invasions of the Normans, that these residences were converted into fortresses, constituting the first feudal castles. (Art. Chateau).

The residence of the kings of France on the island of the Cité at Paris was designated by the name of palace in particular, while men spoke of the castle of the Louvre and castle of Vincennes. All sovereign lords possessed a palace in their domain. At Troyes was the palace of the counts of Champagne, at Poitiers that of the counts of Poitiers, at Dijon that of the dukes of Burgundy. Yet, dating from the 11 th century, and according to the habits of the lords of the middle ages, the palace was either fortified or surrounded by a fortified inclosure; but generally it occupied a more extensive area than the country castle, composed of more varied services, and leaving some dependances accessible to the public. It was the same for the urban residences of the bishops, that also took the name of palace, and that were not absolutely closed to the public like the feudal castles. Several of our old episcopal palaces in France thus retain servitudes, that date back several centuries. The courts, trials, parlements, tribunals of the officials, were held in the palace of the sovereign or bishop; it was then necessary to allow the public to attend these on many occasions. The essential part of the palace is always the great hall, a vast covered area, that served for holding plenary courts, in which vassals were convoked, banquets and festivals were given. Long galleries always accompan-

[illegible]



accompanied the great hall; they served as promenades. Then comes the chapel, sufficiently vast to contain a numerous audience; then the apartments of the lord, lodgings of the courtiers, the treasury, the room for documents; then finally the barracks for the men at arms, kitchens, cellars, storerooms, prisons, stables, yards and nearly always the garden. A principal tower or keep crowned that collection of buildings; also arranged irregularly according to the needs.

Most of those palaces were not built at one spurt, but had been added gradually, according to the wealth or importance of the lord for whom the residence served.

The palace of the kings at Paris, in which those sovereigns held their court from the Capets until Charles V, thus presented at the beginning of the 14 th century a group of structures, the oldest dating in the epoch of S. Louis, and the last in the reign of Philip the Fair. Excavations recently made within the enclosure of the palace of Paris have brought to light some remains of Gallo-Roman structures, notably at the side on Rue de la Barillerie; but in the entirety of the buildings there remains nothing visible, that may precede the reign of Louis IX. From Charles V the palace was exclusively devoted to the service of justice, and the kings no longer occupied it. That sovereign did some internal work there, as well as Louis XI; but Louis XII enlarged it by constructing the building intended for the chamber of accounts, and that occupied on place S. Chapelle the site now devoted to the mansion of the prefect of police. We give (Fig. 2) the plan of the palace of Paris in the ground story, as it existed at the beginning of the 16 th century.

Of the buildings of S. Louis, there has remained as still today, only the S. Chapelle A, the structure B comprised between the two towers of the quay of Horloge, and the square tower C, whose substructure even appeared to belong to a yet earlier epoch. The building B for the kitchens is a little later than the reign of S. Louis. Perhaps the enclosure E with the gates F, that existed on Rue de la Barillerie, and that in the 14 th century still fronted on the ditch, were erected by Louis IX, as well as the keep G, called tower of Montgomery,<sup>1</sup> which remained until about the middle of the last (18 th) century.<sup>2</sup>

Note 1.p.8. It was not that tower in which Montferrant was imprisoned after the journey, that was so fatal to Henry II. Note 2.p.8. To state two very curious legends representing the demolition of the palace before the construction of the existing palace on the court of Henry. These legends belong to a. Legend, and have been little regarded to form a part of a description of the palace, that has not been published.

During the first class the erection of the cathedral W. the street hall I, the portico K and the building L, "very ancient and magnificent works," says Montferrant, "and was then erected, while under the direction of lord Beaumont as architect, count de Combaudville and general of the finances, and as (adds the same author) what men were without employed in an on work rather than those finished men, who only desired to spend the money of the prince." Beaumont is hardly was however and, as everyone knows, who takes something from the moral sense of the remark of the good Parisian Montferrant.

NOTE 2.1.1. MONTFERRANT'S VISIT.

The outlines of the chapter of accounts, commenced by Louis IX and completed by Louis XII, was as W. At V was a passage with little towers, representing remains of which we saw four years since. This passage and the enclosure C with the gray face from the 14th century. As for the enclosure W, its process were visible in the private houses before the construction of the existing building of the correctional police, as ordered by a plan made with the architect by M. Berry, and accompanied by very precious data. At 2 was the chapel of the late the name of St. Michael, at 3 the bridge of the Ombres, and at 4 the bridge of the Millers or Great bridge. At T was the garden, the facade of the king, separated from a little island (island of Vaucou) by a branch of the Seine. There was a building for meetings. Of this vast assemblage of buildings and monuments, there remain today; the St. Genevieve, only given in its annex V in three stories, serving as a treasury of documents; the broad story of the great hall as there is no more; a small square of the exterior of the interior of the building of the kitchens and of the hall; as well as the four towers on the quay of the Hotel; the building L for its entire nature. In the court X was placed the masonry. This assemblage of monuments, all of good archi-



Note 1.p.5. It was not that tower in which Montgomery was imprisoned after the tourney, that was so fatal to Henry II.

Note 2.p.5. So state two very curious drawings representing the demolitions of the palace before the construction of the existing facade on the court of May. Those drawings belong to M. Leseus, and have been lithographed to form a part of a monograph of the palace, that has not been published.

Philip the Fair caused the erection of the galleries M, the great hall I, the porticos K and the building L, "very sumptuous and magnificent works." says Corrozet,<sup>3</sup> who saw them entire, "built under the direction of lord Enguerrand de Marigny, count de longueville and general of the finances, and see (adds the same author) what men were hitherto employed in such work rather than those famished men, who only desired to steal the money of the prince." Enguerrand de Marigny was however hung, as everyone knows, which takes something from the moral sense of the remark of the good Parisian Corrozet.

Note 3.p.5. Antiquities de Paris.

The buildings of the chamber of accounts, commenced by Louis XI and completed by Louis XII, was at M. At N was a postern with little towers, interesting remains of which we saw four years since. That postern and the enclosure O with the quay date from the 14 th century. As for the enclosure E', its traces were visible in the private houses before the construction of the existing building of the correctional police, as proved by a plan made with the greatest care by M. Berty, and accompanied by very precious data.<sup>1</sup> At P was the chapel placed under the name of S. Michel, at R the bridge of the Chargers, and at S the bridge of the Millers or Great bridge. At T was the garden, the lattices of the king, separated from a little island (island of Vaches) by a branch of the Seine. There was a building for heating. Of this vast assemblage of buildings and monuments, there remain today; the S. Chapelle, only deprived of its annex V in three stories, serving as sacristy and treasury of documents; the ground story of the great hall as given in our plan; a considerable portion of the porticos K; the interior of the building of the kitchens and of the hall B, as well as the four towers on the quay of the Horloge; the building L for its entire height. In the court X was planted the maypole. This assemblage of monuments, all of good archi-

the great keep of Montecassino, whose roof appeared above the  
roofs of the great gallery, and S. Casselle with its treasury.  
really formed a beautiful enclosure, although not symmetrical.  
If one turned to the left towards the chapel of S. Michael, he  
discovered the elegant facade of the chapter of accounts with  
its beautiful covered stairway, then the stairway of the S. O.  
Casselle built by Louis VII, and then the great keep left as  
the back of the court. On entering along the chamber of accounts  
one entered the facade of the palace, and saw developed  
the principal facade of the building, of which there was very  
the policy an entire corner. As soon as one reached a new view,  
a staircase, and the variety of all these buildings contributed  
to the richness of the scene. It is very far from being a  
to the old architecture, varying by their richness, so that  
to the architecture since the French capture.

Note 1.9.6. See the plan of the city of Paris, by Louis VII, and the great keep left as the back of the court. On entering along the chamber of accounts one entered the facade of the palace, and saw developed the principal facade of the building, of which there was very the policy an entire corner. As soon as one reached a new view, a staircase, and the variety of all these buildings contributed to the richness of the scene. It is very far from being a to the old architecture, varying by their richness, so that to the architecture since the French capture.

Note 1.9.6. See the plan of the city of Paris, by Louis VII, and the great keep left as the back of the court. On entering along the chamber of accounts one entered the facade of the palace, and saw developed the principal facade of the building, of which there was very the policy an entire corner. As soon as one reached a new view, a staircase, and the variety of all these buildings contributed to the richness of the scene. It is very far from being a to the old architecture, varying by their richness, so that to the architecture since the French capture.

In this palace Charles V received and lodged the emperor Charles IV, probably in the building that occupied the place later assigned to the chamber of accounts. "The king used the emperor to be lodged in his court, and come to the



architecture, presented at the centre of the city the most charming appearance. We have endeavored to give an idea of it in the cavalier view (Fig. 3), taken from the lower end of the island.<sup>1</sup> Foreigners visiting the capital marvelled greatly at the beauty of the buildings of the palace, principally the effect of the court of May, that on entering by the gate opening on Rue de la Barilliere presented a group of structures placed in a most picturesque manner. The grand flight of steps, that entered the second story of the gallery of Enguerand; that on the right ascending on the terrace, communicated with the great hall; the walls of this with its tracery windows; the great keep of Montgomery, whose roof appeared above the roofs of the great gallery, the S. Chapelle with its treasury, really formed a beautiful entirety, although not symmetrical. If one turned to the left toward the chapel of S. Michel, he discovered the elegant facade of the chamber of accounts with its graceful covered stairway, then the stairway of the S. C Chapelle built by Louis XII, and then the great keep left at the back of the court. On passing along the chamber of accounts one entered the gardens of the palace, and saw developed the animated facade of the building, of which there yet remains today an entire portion. At each step appeared a new view, a surprise, and the variety of all these buildings contributed to increase their extent. It is very far from this palace to the cold structures, wearying by their monotony, to which we are accustomed since the grand century.

Note 1.p.6. See Hist. topoq. et Archæol. de l'anc. Paris, by MM A. Lenoir and A. Berty. (Plate X).

Note 1.p.7. See the great birdseye plan of Paris by Merien, and the tapestry of the city hall; Topoq. de la Gaule by Merien; Book III of Cosm. univers., Sebastian Munster and Belle-forest, 1665; Plan of Gomboust; the work of Israel Sylvestre; Topoq. de la France, Impl. Lib.; the work of Penelle (views of bridge of Change); Hist. pitt. du palais de Justice, by S. Sauvon & Schmitt, 1825; Itin. arch. de Paris, by baron de G. Guilhaumy.

In this palace Charles V received and lodged the emperor Charles IV, probably in the buildings that occupied the site later assigned to the chamber of accounts. "Then the king caused the emperor to be lifted in his chair, and borne up the





stairs to his chamber (the emperor was gouty), and then the king at one side led the king of the Romans with his left hand, and thus he conveyed him into his chamber of Irish wood, that looked out on the gardens and toward the holy chapel, a and which he had richly clothed, and all the other chambers behind were left for the emperor and his son; and he was lodged in the chambers and attacs, that his father king John had built."<sup>1</sup>

Note 1.p.9. Livre des faits et bonnes moeurs du sage roy Charles. Chap. 38. Christine de Pisan.

It is certain that these palaces, these grand feudal residences in the middle ages arose successively. According to a custom that we see still observed in the East, each prince adds to the buildings that he finds standing, a building or hall, according to the taste or needs of the moment. There is no general project followed systematically and executed in parts, and far from conforming to an uniform arrangement, the lords that add some building to the residence of their predecessors, aim to give the new work a different character; thus they mark their passage, leaving the imprint of their epoch by building an entirely new lodging according to the taste of the time, rather than appropriate old structures. Those residences then present diversity, not only the parts composing them, but also from each other, and if this programme be the same, the manner in which it has been interpreted differs in each province. Here a chapel assumes a considerable importance, there it is reduced to the proportions of an oratory. In one palace the keep is important as a defensive work; in another it only consists of a building a little larger and higher than the rest of the lodging. The great hall always occupies a vast area, for that is an essential part, a sign of feudal jurisdiction, the place for great assemblages; as in the castles, it possesses a broad flight of steps and rises over vaulted cellars. For example at Troyes, the palace of the counts of Champagne adjoining the church of S. Etienne, that served it as chapel, in comparison to the religious edifice, had but a quite moderate area; its lodgings were few, but the great hall was 170.6 ft. long by about 66 ft. wide. A square tower adjoined the north side of the church and depended on that, but served as treasury and keep. The rooms intended for habi-





habitation were contained in the second story over a vaulted ground story, and were placed in line at one side of the great hall and before the church on the west side; they looked out on the branch of the Seine. A garden at the south side of a court at the north side limited the palace; on that court extended a wide flight of steps serving as the principal entrance of the great hall.<sup>2</sup> Further, the palace of Troyes ceased to be the residence of the counts of Champagne after 1220; they preferred to establish their residence at Provins.

Note 2.p.9. See the plan of this palace in *Voyage Archæologique dans le département de l'Aube*, by A. F. Arnaud. (1837). This palace is entirely destroyed.

The palace of the counts of Poitiers is one of those in France, which have perhaps retained the most beautiful remains. Built on Roman ruins by the Carlovingians, then destroyed on several occasions, it was rebuilt by William the Great at the beginning of the 11 th century; of that structure nothing remains. To Guy-Geoffrey, son of William, is attributed the construction of the great hall, that we see today; but that hall presenting all the characteristics of the civil architecture of the end of the 12 th century, and Guy-Geoffrey being dead in 1086, it is necessary to find another founder for it. The palace of Poitiers was burned in 1346 by the English, then repaired in 1395 by John, duke of Beery and count of Poitou. That prince, brother of king Charles V, caused to be rebuilt the gable wall of the great hall, decorated by an immense fireplace (Art. cheminee, Figs. 9, 10), and the keep that still exists although much mutilated, and that serves today for the assize court.<sup>1</sup> That magnificent structure is composed of a great rectangular building with three vaulted stories, flanked by four round towers at the angles, and is crowned by machicolations, battlements and roofs.

Note 1.p.10. M. Ch. de Cherge in his *Guide du voyageur à Poitiers* says: - "There is found the historical tower of Moubergeon (mahlberg, audiences in covered places, mallobergium), the place where from the origin and under Charlemagne were held public audiences and justice was rendered, to which were since held all capital fiefs of the province. It was in the palace of Poitiers that the dauphin of France was proclaimed king under the name of Charles VII (Oct. 1422); also there was inter-





interrogated by the most skilful doctors, Joan of Arc, the Maid (March, 1429); there were assembled the parlements of Paris and of Bordeaux at the time when France was almost entirely English." If a monument is historical, it is indeed this.

We give (Fig. 4) the plan of the still existing parts of the palace of Poitiers. At A is the great hall, at B the keep. Other buildings existed at C, but of them remain only some traces. The wall of the Gallo-Roman city passed at R and served as substructure of the great hall, whose entrance was at D. A deviation of the public street or perhaps the orientation caused the placing of the keep askew, as indicated in the plan. This palace keep assumes a particular arrangement, which is not that observed in the keeps of castles, that present only one tower or group of lodgings strongly defended by important works, for example like that of the castle of Pierrefonds. The keep of the palace of Poitiers is not itself a little castle, possessing a great hall in each story and chambers in the towers. It assumes the appearance of a fortress, but it is really but a great residence, lighted by wide openings and likewise suited for defense; it approached civil architecture, and the towers and machicolations are there merely as a feudal dress.<sup>1</sup> We give (5) an elevation of the keep of the palace of Poitiers, made of an end. Today these towers are removed to the level N; yet the 16 statues have been retained on their corbels, although much mutilated. Those statues are clothed in the civil costume of the beginning of the 15th century. Did the artist wish to represent the counts of Poitou? That is difficult to know. However that may be, they are beautiful works. The cross section of the keep made on the line B C of the plan (Fig. 6) shows the two lower halls, with their vaults resting on a row of three piers, then the third story forming one great hall without piers. Above are found the attics and the defensive galleries serving the machicolations. A screw stairs placed in the square tower, formerly enclosed in the structures built between this keep and the great hall, allows one to reach the three stories by an oblique passage, as indicated by the plan.

Note 1.p.11. Indeed the projections of the ornaments surrounding the windows, the statues ornamenting the cylindrical towers, would have interfered much with the service of the machi-





machicolations, if one had desired to use them in case of attack. M de Merindol was indeed willing to communicate to us the excellent work, that he has done on the palace of Poitiers, and from his very accurate drawings have been reduced our illustrations.

The palaces of the lay sovereign lords form a sort of oppidum in the midst of the cities in which they are located, and a place both fortified and sacred like the acropolis of the Greek cities. In the palaces of the sovereign were preserved the most precious relics and those most venerated by the people; there were deposited the charters and treasures; there were held planary courts, parlements sat and festivals occurred on the occasion of the marriage of princes and treaties. As for the palaces of bishops, they have a different character, that merits the attention of archaeologists. Situated in the vicinity of cathedrals (which is natural), they are nearly always built along the walls or even on the walls of the city, and can aid in their defense at need. This fact is too general not to have had a common origin. In the first place, it will prove this:— that the palaces of bishops were primitively placed on some fort belonging to the walls of Gallo-Roman cities; in the second place, that the construction of those palaces must have preceded the erection of the cathedrals and have determined their location. Indeed one cannot explain why most of our oldest cathedrals, rebuilt several times on the same site always, since the 7th and 8th centuries, those of Paris, Meaux, Bourges, Amiens, Soissons, Beauvais, Laon, Senlis, Langres, Auxerre, Mans, Evreux, Narbonne, Alby, Angoulême, Poitiers, Carcassonne, Limoges, and so many others, rather stand near the ancien ramparts, than at the middle of the enclosure of the cities. The Gallo-Roman cities possessed either a capitol or at least a fort, beside one of the ramparts, as are still our modern citadels; in the midst of that Gallo-Roman capitol or in one of those forts near the ramparts were placed the first palaces of the bishops. let us not forget that at the end of the 6th century, "the bishops were the natural chiefs of the cities; that they governed the people in the interior of each city; that they represented them before the barbarians; that they were their magistrates inside, their protectors outside." <sup>1</sup>

Note 2.7.11. The site of the episcopal palace is indicated by the plan of the site.

The episcopal palace being erected, a cathedral arose beside it, and the episcopal palace was not rebuilt at the same time. Now there remains to some extent the plan of the palace of the 12th and even the 13th centuries. These plans present a nearly uniform arrangement: a great hall, a chapel, a tower or keep, and various dependencies between the palace and the cathedral, and the remains that were probably of little importance, since no traces of them are found. The representative mark of the episcopal house, both religious and civil in the first centuries of the middle ages, is the great hall, a canonical and civil hall and as such a fortress. The palace of the bishop of Paris, rebuilt by bishop Maurice de Sully about 1150, still retained this character; it contained nearly replaced an earlier hall, whose foundations were discovered by us in 1845 and 1846, and could have been a fine Roman structure. There was one residence mentioned by Gregory of Tours, and which existed in his time. In the episcopal palace chapel, whose remains are still seen in 1850, was this fine inscription, reported by J. de Gervais: "This basilica (the chapel) was consecrated by John Maurice, bishop of Paris, in honor of the blessed Martin, the blessed Maurice, Vincent, Maurice and all the saints." Now this chapel rebuilt by Maurice de Sully, consisted of a great hall, with pillars attached to the choir of the cathedral, which was rebuilt at the same time, and the chapel. The traces of the private lodgings of the bishop. Here (Fig. 7) is the plan of the episcopal palace of the 12th century.

Note 2.7.12. The site of the episcopal palace is indicated by the plan of the site.

At A was the chapel, at B the keep, and at C the great hall, which did not even extend beyond the table wall D. The choir of the cathedral rebuilt by Maurice de Sully is at A, the hall F served as a treasury in the second century, with remains of a communication between the palace and the choir, and as a stairway in the second story. The great hall in the second story had a single vaulted interior. Here the Gallo-Roman wall of the city passed at M under the cathedral and beyond the wall, and in excavating for foundations of the new stairway, we found a number of the same stones at B and C. It would



Note 1.p.14. Guizot. Hist. de la civiliz. en France 8<sup>th</sup> leçon.

The episcopal palace being erected, a cathedral arose beside it, and each time that the cathedral was rebuilt anew, it was rare that the episcopal palace was not rebuilt at the same time. Now there remain to some plans of bishop's palaces of the 12<sup>th</sup> and even the 11<sup>th</sup> centuries. These plans present a nearly uniform arrangement; a great hall, a chapel, a tower or keep, various dependances between the palace and the cathedral, and lodgings that were probably of little importance, since no traces of them are found. The representative mark of the episcopal power, both religious and civil in the first centuries of the middle ages, is the great hall, a canonical and civil curia and at need a fortress, that later became the offices and the hall of the synod. The palace of the bishop of Paris, rebuilt by bishop Maurice de Sully about 1160, still retained this character; it otherwise merely replaced an earlier palace, whose foundations were discovered by us in 1845 and 1846, and could pass for a Gallo-Roman structure. That was the residence mentioned by Gregory of Tours, and which existed in his time. In the episcopal palatine chapel, whose remains we still saw in 1830, was read this inscription, reported by P. du Breuil;<sup>2</sup> "This basilica (the chapel) was consecrated by lord Maurice, bishop of Paris, in honor of the blessed Maria, the blessed martyrs Dionysius, Vincent, Maurice and all the saints." Now that palace rebuilt by Maurice de Sully, consisted of a great hall, with buildings attached to the choir of the cathedral, which was rebuilt at the same time, and the chapel. No traces of the private lodgings of the prelate. Here (Fig. 7) is the plan of that episcopal palace of the 12<sup>th</sup> century.

Note 2.p.14. Theatre des antiquités de Paris. 1612.p.43.

At A was the chapel, at B the keep, and at C the great hall, which did not then extend beyond the gable wall D. The choir of the cathedral rebuilt by Maurice de Sully is at A, the hall F served as a treasury in the second story, with stairs of communication between the palace and the choir, and as sacristy in the ground story. The great hall in the second story formed a single vaulted interior. Here the Gallo-Roman wall of the city passed at M under the cathedral and beyond its apse, and in excavating for foundations of the new sacristy, we found a substructure of the same epoch at G and P. It would

from about the end of the 15th century, and was probably  
on formed by the addition of the 15th, a sort of fort, to an  
close towards the southern wall of the  
great hall was itself built on the foundations of the 12th-  
Roman wall and was also overlaid by Henry de Sully. "When,"  
says R. de Bretil, "the church and the people went from the  
great hall to the great church (the cathedral) by the gallery  
(the wing W), which the successive lord bishops Bonchamps (of  
the 15th century) sometimes left to the canon, who deposed  
of there the relics and the most beautiful ornaments. After  
lord Pierre d'Orléans (beginning of the 15th century) con-  
ed the building of the second lodgings, that he placed as much  
on the garden as on the great place (this is the building H).  
Long afterwards lord Jean de Bonchamps (beginning of the 15th  
century), 102nd bishop of Paris, caused the erection of a  
the building adjoining the old one, which is opposite the ch-  
uron, where is now the hall and other negotiations (this is the  
table building at W). Lord Bonchamps de Breton, his nephew and  
successor, caused the erection of the third lodgings, which  
is called the chapel (this is the building L). In that place  
were originally the studies and some little houses in which  
he had the four corners of the lower chapel." The chapel in fact  
and two stories, like that of Meaux, and later that of Reims.  
The structure C only dated from the 17th century, and at R  
were the buildings added to the Hotel-Dieu. The noble bridge  
was built later, after all these structures. The entrance of  
Paris had only this palace with only a great hall for some  
centuries. Hence de Breton in 1596 had his mansion at the  
was demolished. William de Camille, his successor, lodged in  
the de Breton, and gave his lodging for the foundation of the  
College of France or of St. Michael. Pierre d'Orléans, who oc-  
lit the annex K to the great hall of the episcopal palace, in  
indicated the mansion was demolished, that belonged to Henry  
lion d'Orléans, his father, and sold it to the duke of Berry,  
of whom he was councillor. Grand de Montaigne had a house in  
the rue Marthe and another in the St. André-des-Arts. I think  
the river and certain the nose of the cathedral extended back-  
as, that is the character of the chapter built at the  
north-east. The great cathedral hall of the 12th century, w  
with the annex erected by Pierre d'Orléans at the beginning



then appear that the bishops of Paris profited by a projection formed by the defenses of the city, a sort of fort, to enclose therein the episcopal palace. The southern wall of the great hall was itself built on the foundations of the Gallo-Roman wall and was also crenelated by Maurice de Sully. "Then," says P. du Breuil, "the bishop and his people went from the great hall to the great church (the cathedral) by the gallery (the wing F), which the succeeding lord bishops Ponchers (of the 16th century) sometimes left to the canons, who deposited there the relics and the most beautiful ornaments. After lord Pierre d'Orgemont (beginning of the 15th century) caused the building of the second lodgings, that he placed as much on the garden as on the sacred place (this is the building H). Long afterwards lord Etienne de Poncher (beginning of the 16th century), 102nd bishop of Paris, caused the erection of the building adjoining the old one, which is opposite the church, where is now the jail and other habitations (this is the double building at K). Lord Francis de Poncher, his nephew and successor, caused the erection of the third lodgings, which is behind the chapel (this is the building L). In that place were previously the stables and some little houses in which dwelt the four canons of the lower chapel." The chapel in fact had two stories, like that of Meaux, and later that of Rheims. The structure O only dated from the 17th century, and at R were the buildings ceded to the Hotel-Dieu. The double bridge S was built later, after all these structures. The bishops of Paris had only this palace with only a great hall for some centuries. Hughes de Besancon in 1326 had his mansion at Rue des Amondiers. William de Charac, his successor, lodged in Rue de Bievre, and gave his lodging for the foundation of the college of Charac or of S. Michel. Pierre d'Orgemont, who built the annex K to the great hall of the episcopal palace, inherited the mansion des Tourneller, that belonged to chancellor d'Orgemont, his father, and sold it to the duke of Berry, of whom he was chancellor. Girard de Montagne had a house in Rue des Marmosets and another in Rue S. Andre-des-Arts.<sup>1</sup> Along the river and behind the apse of the cathedral extended gardens, that adjoined the cloister of the chapter built at the northeast. The great crenelated hall of the 12th century, with its annex erected by Pierre d'Orgemont at the beginning

of the 15th century, the house and its chapel in two stories, and a very grand appearance from the bank of the river, as is shown by the perspective (Fig. 8) taken from the corner V. The house is situated on the left bank of the river.

Note 1.9.16. General. Book VII.

Note 2.9.16. See the topography of the city hall; the plan of the house; the great staircase plan of Paris by Veron; the plan of the house of the 15th century; those of the 16th century; the plan of the house of the 17th century; the plan and sections deposited in the archives of the house, and traces of which M. A. Veron has had the courtesy to communicate to me; an engraving of the plan of Notre Dame by L. von Kellen, that shows the upper part of the building.

One of the oldest ecclesiastical palaces, that of Amiens, Paris, towards the end of the 11th century, still retains its great character, and very important dimensions, that date from the same epoch. Records directed by the Russian architect, M. Joly-Besnier, have caused to be restored a part of the building, and the great hall, which is placed in direct communication with the north transept of the cathedral. One even notes certain portions of walls of this palace, that have entirely the character of the Gallo-Roman construction of the late time, and that could rather have belonged to them, as Dr. Gisors has observed at the restoration, that the early part of the old house of Amiens, destroyed, and erected on the site of the old house of Amiens. At the present place of Amiens exists a small part of the 15th century, of the second half of the 15th century, having the closest relation to that of the old house of Amiens of Paris, and the lower story of the great hall. This story, and story, like that of the ecclesiastical palace of Paris, consists of two vaulted aisles. The palace of Amiens is likewise built in the vicinity of the Gallo-Roman remains. At Amiens the bishop's palace rests on a part of the ancient wall, but of the structure of the old palace there remains only a small tower of the beginning of the 12th century and some fragments of the same epoch. At Amiens the ecclesiastical palace joins the ancient house (Fig. 9), and the 15th century wall. At Amiens the lower story of the great hall dates from the beginning of the 12th century, the house and its chapel in two stories, and a very grand appearance from the bank of the river, as is shown by the perspective (Fig. 8) taken from the corner V. The house is situated on the left bank of the river.



of the 15 th century, its keep and its chapel in two stories, had a very grand appearance from the bank of the river, as is shown by the perspective (Fig. 8) taken from the point V<sup>2</sup> before the additions O and the construction of the double bridge.

Note 1.p.18. Sauval. Book VII.

Note 2.p.18. See the tapestry of the city hall; the plan of Gomboust; the great birdseye plan of Paris by Merlon; the views of Israel Sylvestre; those of Perelle; the plan of the island by abbe Delagrive; the plans and sections deposited in the archives of the empire, and tracings of which M. A. Bertu has had the courtesy to communicate to us; an engraving of the place of Notre Dame by L. van Kerlen, that shows the upper part of the building B.

One of the oldest episcopal palaces, that of Angers, built toward the end of the 11 th century, still retains its great Romanesque hall in a beautiful style (Art. Salle), and very important dependances, that date from the same epoch. Recent works directed by the diocesan architect, M. Joly Leterme, have caused to reappear a part of the lodgings surrounding that great hall,<sup>3</sup> which is placed in direct communication with the north transept of the cathedral. One even notes certain portions of walls of this palace, that have entirely the character of the Gallo-Roman construction of the late time, and that could indeed have belonged to them, as Dr. Cattois observed at the habitation, that the early mayor of the palace of Neustria, Rainfroy, had erected on the site of the capitol at Angers. At the bishop's palace of Meaux exists a chapel of two stories, of the second half of the 12 th century having the closest relation to that of the old bishop's palace of Paris, and the lower story of the great hall. This ground story, like that of the episcopal palace of Paris, consists of two vaulted aisles. The palace of Meaux is likewise built in the vicinity of the Gallo-Roman ramparts. At Soissons the bishop's palace rests on a part of the ancient wall, but of the structure of the old palace there remains only a small tower of the beginning of the 13 th century and some substructures of the same epoch. At Beauvais the episcopal palace joins the ancient Roman fortification, and a little tower dating from the 12 th century flanks even the old Roman wall.<sup>1</sup> At Rheims the lower story of the great hall dates from the begin-

...of the 12th century, and the story cannot from  
the middle of the 13th century. (Arch. Catalana). As a result,  
one of the walls of the great hall still exists and the  
rest from the middle of the 13th century, five are made of  
stone and the others are made of brick. The story rests on the  
first of these; a gallery on the 13th century rests on the  
old wall of the Salto-Roman city. At present, one likewise finds  
very considerable remains of the 13th century, the latter  
of one of the walls of the great hall. At present the apoc-  
ryphal remains of the 13th century (the walls of the  
is now disappearing to a great extent. The walls were rebuilt after  
the fire in 1112, which destroyed the old cathedral and the adjo-  
ining buildings. Indeed, one finds in the present palace of  
each of the structures belonging to the style of the 13th  
century of the 13th century, notably the chapel A (Fig. 9)  
and the building B. As for the great hall C erected on a gro-  
und and a great portion of the cathedral, its con-  
struction is due to a great extent (1112). The great hall is  
lighted from the south and from the country. The interior of  
the porch was rebuilt at an apocryphal early. The apocryphal  
rebuild, and the style of the windows were lowered; the porch  
of this rebuilding is by conserving the antique certain area B.  
The porch and the style of the windows were lowered.  
The appearance of this great porch on the exterior must  
have been very beautiful before the modifications that altered  
its character. This facade which dominates the wall of the  
city remains parallel to some extent from the base, is flanked  
by three large bays on each side, and between which occur  
the windows of the great hall in the second story. The coun-  
ty was formerly ornamented, and could be used as a sec-  
ond balcony above the entrance of the city, dominating a series  
of terraces. Here (Fig. 10) is a view of the external facade  
taken from the corner B. In the 13th century the porch of  
plan (see plan, Fig. 9) erected the two structures B and C.  
A fortified site was occupied at K.  
Note 8.9.12. See in Vol. II of Arch. Catal. et Rom. of Verdier  
& Göttsche, p. 201, the plan of the episcopal palace.  
Note 1.9.18. That little tower still exists. (See Arch. Catal.  
et Rom. of Verdier & Göttsche, Vol. I.  
The central portion of the tower of the great hall is  
the same site as the present site of the cathedral.



beginning of the 13 th century, and the two story chapel from the middle of the 13 th century. (Art. Chapelle). At Auxerre, one of the gable walls of the great hall still exists and dates from the middle of the 13 th century, like the choir of that cathedral; a gallery of the 12 th century rests on the old wall of the Gallo-Roman city. At Rouen, one likewise finds very considerable remains of the 13 th century, and notably of one of the gable walls of the great hall. At Laon the group of buildings of the bishop's palace (now palace of justice) is most interesting to study. This palace was rebuilt after a fire in 1112, which destroyed the old cathedral and the adjoining buildings. Indeed, one finds in the bishop's palace of Laon portions of structures belonging to the style of the first half of the 12 th century, notably the chapel A (Fig. 9) and the building B. As for the great hall C erected on a ground story and an added portico beside the cathedral, its construction is due to bishop Garnier (1245). The great hall is lighted from the court O and from the country. The internal portico was rebuilt at an epoch already early. The arches were rebuilt, and the sills of the windows were lowered; the proof of this rebuilding is by observing the unique return arch E, whose curvature and primitive ornamentation are preserved. The appearance of this great structure on the exterior must have been very beautiful before the mutilations that altered its character. This facade which dominates the wall of the city passing parallel at some yards from its base, is flanked by three turrets borne on buttresses, and between which open the windows of the great hall in the second story. The cornice was formerly crenelated, and could at need serve as a second defense above the rampart of the city, dominating a steep precipice. Here (Fig. 10) is a view of that external facade taken from the point P. In the 15 th century the bishops of Laon (see plan, Fig. 9) erected the two structures F and G. A fortified gate was opened at K.

Note 3.p.16. See in Vol. II of Arch. civ. et dom. of Verdier & Cottais, p. 201, the plan of the episcopal palace.

Note 1.p.18. That little tower still exists. (See Arch. civ. et dom. of Verdier & Cottais. Vol. I.

The portico occupying half the length of the great hall of the court side gives to the episcopal palace a particular appearance. That gallery is exposed to the south

appearance. That delivery is exposed to the south on a slight  
whose temperature is usually cold, serves as a promenade, and  
contributes to the comfort of the habitation. The episcopal  
palace of Louis, the latter is a very beautiful house, but as it  
has been destroyed since the revolution, only the ruins remain.  
The episcopal palace, although rebuilt at the end of the 18th and during  
the 19th centuries, is still an actual episcopal place probably  
erected on the site of the episcopal of the Roman city. After  
the palace of the Pope, this is the most important residence  
in France, that remains to us from the numerous residences  
occupied by the princes of the Church.

The episcopal palace of Verdun is connected to the  
existing cathedral, founded in 1078, by a cloister built by  
Bishop Thierri de la Roche in the second half of the 11th  
century. Already in 1200 the great square tower of the palace,  
serving as keep, had been built by Archbishop Gilles. Pierre  
de la Roche erected between the cloister and east tower exten-  
sive buildings that still exist in three parts, and that con-  
tain several round towers, lodgings, a great hall and another  
square tower forming a courtyard for the keep. Still, in the mid-  
dle of these structures of the middle ages one still finds a ve-  
ry old Romanesque tower, and a beautiful doorway of the begin-  
ning of the 12th century.

It is true that the archbishops of Verdun were powerful  
lords during a part of the middle ages, and their palaces after  
the 11th century assumed an importance corresponding to the  
importance of the city. In 1096 Archbishop Thierri assumed the title of  
duke of Lorraine. The city of Verdun flourished and reached its  
peak in the 12th century. The city was then a very important  
and strong.

Until the 12th century, the commune possessed considerable  
power and took the title of noble or knightly man. These powers were  
lost and the commune was reduced to a simple commune in 1382.  
The commune was then reduced to a simple commune, and later on  
a communal body with the title of commune, and later on  
a simple commune. In 1312 Arnold Arnould, lord  
of the town and archbishop of Verdun, decided himself to  
and the commune returned power to him. Then the only way  
to save the commune was to give it the title of commune, and  
viscount and the lord of St. -and; in 1382 these three person-



appearance. That gallery is exposed to the south on a plateau whose temperature is usually cold, serves as a promenade, and contributes to the comfort of the habitation. The episcopal palace of Laon, like those we have described above, was no less<sup>3</sup> fortified place very well located, easy to guard and defend. We see that the archiepiscopal palace of Narbonne in Languedoc, although rebuilt at the end of the 13<sup>th</sup> and during the 14<sup>th</sup> centuries, is still an actual strong place probably erected on the site of the capitol of the Roman city. After the palace of the Popes, this is the most important structure in France, that remains to us from the numerous residences occupied by the princes of the Church.

The archiepiscopal palace of Narbonne is connected to the existing cathedral, founded in 1272, by a cloister built by archbishop Pierre de la Jugee in the second half of the 14<sup>th</sup> century. Already in 1208 the great square tower of the palace, serving as keep, had been built by archbishop Gilles. Pierre de la Jugee erected between the cloister and that tower extensive buildings that still exist in great part, and that comprise several round towers, lodgings, a great hall and another square tower forming a pendant to the keep. Still, in the midst of these structures of the middle ages one yet finds a very old Romanesque tower, and a beautiful doorway of the beginning of the 12<sup>th</sup> century.

It is true that the archbishops of Narbonne were powerful lords during a part of the middle ages, and their palace after the 11<sup>th</sup> century acquired an importance corresponding to their fortune. In 1096 archbishop Dalmatius assumed the title of primate of Gaul. The city of Narbonne further had retained in part its Roman municipal administration, like many cities of the South.

Until the 12<sup>th</sup> century, the commune possessed councillors who took the title of noble or upright men. Then they were termed consuls, or rather "cossouls." That commune in 1166 made a commercial treaty with the republic of Genoa, and later with Pisa, Marseilles, Rhodes, etc. In 1212 Armond Amalric, legate of the Pope and archbishop of Narbonne, declared himself duke, and the viscount rendered homage to him. Then the city was under the jurisdiction of three lords, the archbishop, the viscount and the abbot of S. Paul; in 1232 these three person-





personages confirmed the franchises and customs of the commune. Yet in 1234 the consuls of Narbonne invoked the aid of the consuls of Nîmes against the archbishop, and in 1255 the municipal magistrates ordered that the customs of the city be translated from Latin into Romance, so as to put them within reach of all. The viscounts were less powerful than the archbishops, and were inclined to protect the prerogatives of the Narbonnese, and the presence of that increasing strife against the peace of the lord archbishops, Gilles Ascelin erected in 1318 an enormous tower still intact today, and that his successors made their residence, an actual strong castle, connected to the cathedral and itself fortified.<sup>1</sup>

Note 1.p.21. We owe these historical statements to M. Tournai, conservator of the museum of Narbonne.

This mixture of architecture, military, religious and civil, thus made of the episcopal palace of Narbonne an edifice most interesting to know. Let us first say that it is unnecessary to seek there the influences of the Italian art of the 14<sup>th</sup> century; that edifice is indeed French, and rather southern French than that of Languedoc. Its roofs were steep, as proved by several existing gables; the construction of the vaults, sections of piers, the cloister and its details, the form of the windows, the defensive positions, and even the masonry, belong to the architecture of the royal domain; the archiepiscopal palace of Narbonne is the more curious for study, in that it must have served as a point of departure for constructing the palace of the Popes at Avignon, with which we shall soon occupy ourselves.

Here (Fig. 11) is the plan of the palace of the archbishops of Narbonne in the ground story. At A is the cathedral, begun in 1272 as we have stated, on the French plan. (Art. Cathédrale, Fig. 43). An ancient strong place<sup>2</sup> is at B, that very probably occupies the site of the forum of the Roman city. The foundations of the antique capitol determined the arrangement of the buildings, that pass around it from the angle C to the cathedral. At D is a Roman tower, and at E are buildings, some parts of which belong to the 12<sup>th</sup> century. The great square tower built by Gilles Ascelin in 1318 is at F. It is placed on the square opposite the much lower tower of the viscount, consequently it dominates the tower of the lay lord





and the canal that connects it with the part, that passes at about 33 ft. from the point C. From the place B to the cloister G the ground rises about 16.4 ft. One enters the court H of the palace, passing under an arch I and taking a street bordered by fortified buildings, and through the great vaulted porch L. At O was the hall of the guards, communicating in the ground story with the tower called S. Martial at U by internal steps. By passing along the street K and under a fortified arch, one reaches the flight of steps Q, that ascends to the cloister, which communicates with the cathedral by a doorway R.

Note 2.p.21. Now called Place aux Herbes.

From the court H by descending the steps S terminating in the uncovered area S', and taking at the left a tunnel passing under the great building V, one reached a postern T opening into a ditch, that separated the entire front from a garden, forming an advanced work. The great structure V was occupied in the ground story by cellars arranged under the great hall. From the court H one ascended to the apartments by a stairway X, now destroyed.<sup>1</sup> At d and d' were porticos, and at Z a receding structure that connected the great tower to the tower S. Martial.

Note 1.p.22. This stairway was destroyed about 1620, and replaced by a beautiful stairway placed in the tower Y. From 1620 to 1634 were erected new facades in the court, and grand apartments were arranged, now partly occupied by the museum of the city. We have found traces of the foundations of the stairs X.

The last portion, of which we saw only fragments before 1847, included in far more recent habitations, was razed to give place to the new building of the city hall. But having been charged to direct that last structure, we have been able to determine the arrangement of the great buttresses M with machicolations, and of the little guard room N with its postern n. The buildings p are called the Madeleine and are the oldest. They consist of a vaulted story and a great hall t, also vaulted, beneath a beautiful chapel arranged in the second story; this hall t communicates with the passage called Ancre<sup>1</sup> by two doors V V'. Those doors V V' must permit the public to enter the hall t, which served as the lower chapel. Those doors V V' must permit the public to enter the hall t,





which served as the lower chapel. A common court was arranged at m with a small fortified building e. The wall of the palace of the archbishop joined that of the cathedral by a wall f, also fortified. At g is a great chapter hall. The apse of the cathedral continued the defenses at that side f by a series of little crenelated towers connected by arches surmounted by battelements, like the crowning of the chapel. This palace then presented an entirety of formidable dimensions dominated by the enormous square tower F forming a projection.

Note 1.p.23. This passage was so designated, because beneath the arch was suspended an anchor as a sign of the rights that the archbishops possessed over the port of Narbonne.

Let us now examine the plan of the second story of this palace (Fig. 12). The stairway X allowed one to pass directly from the court of the great hall V, possessing a vast fireplace, traces of which are still seen on the exterior. That great hall was lighted by high windows terminating in pointed arches and covered by round arches, supporting floor beams above which was a celled story opening on the external battlements. From the great hall one could reach all the apartments. Screw stairs allowed a descent to the ground story at several places, or ascent to the upper stories. One sees that he could enter the octagonal hall of the square tower only by a bent passage, and from that octagonal room he descended by a trap door into the circular room of the ground story, which served for a prison. Large machicolations opening on the third story at the height of the battlements defended the front a b. Here was recognized the utility of the passages arranged at I and P, on the two arches crossing over the street K; they established communication between the building L and that of the Madeleine at T, with the tower U of S. Martial and the chapel M. The cloister was covered by a terrace and afforded a promenade, from which one could enjoy a singularly picturesque view of all these buildings, one behind the other, surmounted at one side by the great square tower, on the other by the colossal apse of the cathedral.

These structures are built of beautiful stone from S. Jean and from Beziers; they cover an area of about 40,357 sq. ft. after deduction of the courts, and in spite of the numerous mutilations they have suffered, although modern flat roofs wi

without, however, have replaced the old stone roof, and the  
the most interesting part, yet they do not fail to the im-  
and by their beautiful and noble corner.

It gave (1818) a complete view of this place, which from  
the old palace of the archbishop of Avignon, it contained  
the old palace of the archbishop of Avignon, it contained

it is necessary to give a historical summary of their action  
in County Venetian, in order to show to be understood the in-  
portance of this residence of the sovereign counts.

In the 12th century the rock of Avignon, on which was to  
rise the palace of the Pope was partly pasture, partly cov-  
ed by vegetation dominated by the old castle or palace of  
the counts, not far from which stood the old church. Of  
some structures preceding the seizure of the counts, the  
exists today.

Note 1. p. 25. *Avignon*.

Pope Clement V came to Avignon in 1309 and resided in the  
masonry of the old palace (Cathedral). Clement V was  
born in France, archbishop of Bourges; this prince pre-  
sented at the court of the King of France, Philip the Fair. That  
prince had an interview with him: - "Gentleman," said he to  
him, "I can make you Pope if I wish, provided you promise  
me to grant me six thousand, but I will make to you." There-  
after he fell on his knees and replied to him: - "Gentleman, now

I see that you love me more than my living man, and that you  
desire to render me good for evil. Command and I will obey."  
Thereafter the Pope was elected and came to establish himself  
in Avignon in France.

John XIII dwelt in the palace, then situated on the site  
of the existing palace of the Pope (1312).

Remond de Vis, his nephew and bishop of Avignon, had no pa-  
lace, purchased the land on which was built the palace of the  
archbishop, today occupied by a little seminary. John XIII  
desiring to enlarge the palace occupied by him, caused to be  
demolished the parish church of St. Etienne, which he trans-  
ferred to the chapel St. Mathias.

Gregory XII in 1386 caused the demolition of the castle



without character have replaced the old steep roofs, and although miserable additions or neglect has destroyed several of the most interesting parts, yet they do not fail to the imposing by their grandeur and their power.

We give (Fig. 13) a cavalier view of this palace, taken from a side of the great square tower. (Arts. Cloitre, Salle, Tour). But this palace of the archbishops of Narbonne, if compared to the palace of the Popes at Avignon is but a poor lodging. It is necessary to give a historical summary of their sojourn in county Venassin, in order to cause to be understood the importance of this residence of the sovereign pontiffs.

In the 13<sup>th</sup> century the rock of Avignon, on which was to rise the palace of the Popes was partly pasture, partly covered by habitations dominated by the old castle or palace of the podesta, not far from which rose that of the bishop.<sup>1</sup> Of these structures preceding the sojourn of the pontiffs, the church of Notre Dame des Doms served as cathedral and alone exists today.

Note 1.p.25. Latin note.

Pope Clement V came to Avignon in 1308 and resided in the monastery of the preaching friars (Dominicans). Clement V was Bertrand de Grotte, archbishop of Bordeaux; this prelate passed as the enemy of the king of France, Philip the Fair. That prince had an interview with him:- "Archbishop," said he to him, "I can make you Pope if I wish, provided that you promise to grant me six requests, that I shall make to you." Bertrand fell on his knees and replied to him:- "Monseigneur, now I see that you love me more than any living man, and that you desire to render me good for evil. Command and I will obey." Bertrand de Grotte was elected and came to establish himself at Avignon in France.

John XXII dwelt in the palace, then situated on the site of the existing palace of the Popes (1316).

Armond de Via, his nephew and bishop of Avignon, had no palace, purchased the land on which was built the palace of the archbishop, today occupied by a little seminary. John XXII desiring to enlarge the palace occupied by him, caused to be demolished the parish church of S. Etienne, which he transferred to the chapel S. Madaleine.

Benedict XII in 1336 caused the demolition of the entire





palace, that his predecessor had caused to be erected, and after the plans of the architect Pierre Obreri,<sup>1</sup> caused the building of the northern portion of the apostolic palace, then terminated by the tower of Trouillas. Under that pontiff, the apostolical chamber purchased the palace, that Armond de Via had built to serve as a residence for the bishops of Avignon. Clement VI caused the erection of the southern facade of the palace of the Popes, and the southern enclosures, which essentially served to contain the arsenal.

Note 1.p.26. Or Pierre Obrier, according to *Annales d'Avignon*, Vol. III.-- Manuscripts given to the museum of Avignon by M. Achard, archivist of the prefecture.

Only in 1347 the city of Avignon and the county of Venaissin became the property of the Popes. Avignon belonged to Jane of Naples, who was countess of Provence at the same time as queen of the two Sicilies. Driven from Naples as suspected of complicity with the assassins of her husband, Andrew of Hungary, Jane sought refuge in Provence, and came to cast herself at the feet of Clement VI. When she left Avignon to return to her Italian states, she was declared innocent of the crime of which the public voice accused her; she was furnished with a dispensation to marry her cousin, Louis of Tarentum, the principal instigator of the assassination of Andrew. Avignon and the county of Venaissin belonged to the Pope. This cession had been stipulated for the price of 80,000 crowns.

Innocent VI completed the southern part of the great upper chapel. Urban V caused the cutting in the rock of the site of the principal court of the palace, and excavated a well there; he caused the construction of the eastern wing looking on the gardens, and added a seventh tower, called of the angels, to the six previously built.

Gregory XI departed for Rome in 1376 and died in 1378. Thus the palace of Avignon had been the seat of the papacy from 1316 to 1376, 60 years under 6 Popes. The papacy was then French, chiefly elected among Gascon and Limousin prelates. The French installed candidates of their choice in the bosom of the sacred college, and maintained their predominance during the sojourn of the Popes at Avignon. This fact should not be forgotten, since as we shall soon see, it had an influence on the construction of the palace of the Popes at Avignon.

The antiques, Clement VII and Benedict XIII, occurred the  
palace of Avignon from 1279 to 1378 (year).  
Benedict XIII was deposed in one palace by natural forces  
and on Sept. 2, 1378. The state was converted into a clerical  
state with the papacy as the center of power.  
John, nephew of Benedict XIII, was deposed and of Robert  
displaced by the leaves of the Pope of Rome and by Charles  
of Orleans, sent by the King of France in 1400. He was  
sent to the castle of Avignon in 1400.  
Benedict XIII, 1411.  
The castle of Avignon was built in 1331 by the  
Pope and the apartment called in Avignon looking south, a  
and the covered gallery was connected to the apartments with  
the tower known as the tower of the Pope.  
In the palace of Avignon were held six con-  
ferences for the election of Benedict VII in 1378; Clement VI in  
1362; Innocent VI in 1362; Urban V in 1362; Gregory XI in 1370;  
Benedict XIII in 1374.  
As a result of the conflict that occurred between the men of  
the Pope and those of John of Aragon, and those of Louis XIV  
as the Holy See, the election remained at the court of  
some appearing insignificant, the King of France caused Avignon  
to be occupied by his troops, and he transferred the sovereignty  
completely, that he would send a treaty to Rome (1378). General  
agreements by the treaty of Avignon contained the cessation of  
Roman and of the country of Avignon.  
Thus in 1378 the Pope not only caused the erection of  
the residence, but even the entire walls of the city, whose  
extent is 15,715 ft., or about 3 miles.  
In 1378 a fire destroyed nearly all the roofs of the palace  
of the Pope. In 1418, the great hall of the consistory, the  
quarter of the kitchen and part of the battery were consumed,  
in spite of the diligence of John, nephew of Pope John XIII,  
who commanded them in that city.  
Note 1. p. 27. Those of that disorder are still to be seen  
in the upper parts of the walls. In the year 1878 at the  
hour of the death of Pope Gregory of Rome, according to the  
old documents of Provence, the palace of Avignon was seized  
by that party, that was near in the power of men, whatever



The antipopes, Clement VII and Benedict XIII, occupied the palace of Avignon from 1379 to 1403 (war).

Benedict XIII was besieged in the palace by marshal Boucicaut on Sept. 8, 1398; The siege was converted into a blockade until after the departure of that pontiff in 1403. Roderic de Luna, nephew of Benedict XIII, was besieged anew or rather blocked by the legates of the Pope of Rome and by Charles of Poitiers, sent by the king of France in 1409. He evacuated the palace as well as the castle of Oppede by a capitulation dated Nov. 22, 1411.

The cardinal legate (cardinal of Clermont) caused to be built in 1513 the apartment called la Miranda looking south, and the covered gallery that connected those apartments with the towers looking on the garden; there the vice legates received their visitors.

In the palace of Avignon were held six conclaves.

That for the election of Benedict XII in 1335; Clement VI in 1342; Innocent VI in 1352; Urban V in 1362; Gregory XI in 1370; Benedict XIII in 1394.

As a result of the conflict that occurred between the men of the Pope and those of duke de Crequy, ambassador of Louis XIV at the Holy See, the satisfaction demanded at the court of Rome appearing insufficient, the king of France caused Avignon to be occupied by his troops, and he threatened the sovereign pontiff, that he would send a regiment to Rome (1662). General Bonaparte by the treaty of Tolentino obtained the cession of Romagna and of the county of Avignon.

Thus in 60 years the Popes not only caused the erection of that residence, but even the entire walls of the city, whose extent is 15,718 ft., or about 3 miles.

In 1378 a fire destroyed nearly all the roofs of the palace of the Popes.<sup>1</sup> In 1413, the great hall of the consistory, the quarter of the kitchens and that of the buttery were consumed, in spite of the diligence of Mark, nephew of Pope John XXII, who commanded then in that city.<sup>1</sup>

Note 1.p.27. Traces of that disaster are still to be seen in the upper parts of the edifice. "In the year 1378 at the hour of the death of Pope Gregory at Rome, according to the old documents of Provence, the palace of Avignon was seized by that fury, that was never in the power of men, whatever





aid came from all parts, to extinguish or arrest, so that the greater part of that grand and superb edifice was devoured by the flames, as I have myself seen the marks and vestiges in that fiery and lofty mass of stones." *Mostredous. Hist. de Provence. p. 437.*

Note 1.p.28. Journal d'un habitant d'Avignon, cited by Gouffridi. *Hist. de Provence.*

The extended documents that M. Achard, architect of the prefecture of Vaucluse, has kindly gathered for us with a readiness for which we cannot sufficiently thank him, give only the name of the architect of that colossal colonnade; it was a certain Pierre Obreri or Obrier. Obreri is scarcely an Italian name, but what is still so is the monument itself. The Italian architecture of the 14th century, whether taken in the south or the north of the peninsula, recalls nothing of that of the palace of the Popes. From the tower of Trouillas to that of the Angels, in the entire extent of these buildings from north to south and east to west, the construction, mouldings, sections of piers, vaults, openings of defenses, belong to the French architecture of the south, to that Gothic architecture which with difficulty disengages itself from certain Romanesque traditions. The ornamentation is further very sober and recalls that of the cathedral of Narbonne in its upper parts, which date from the beginning of the 14th century. Now the cathedral of Narbonne is the work of a French architect, perhaps the same that built that of Clermont in Auvergne and that of Limoges, as one might suppose from the perfect conformity of these three plans. The sole details of the palace of Avignon, which are evidently of Italian origin are the paintings attributed to Giotto and to Simon Memme or his pupils.<sup>2</sup> Let us further not forget, that Clement V, that established the apostolic seat at Avignon, was Bertrand de Grotte, born at Villandun near Bordeaux; that John XXII, his successor, was Jacques d'Esse, born at Cahors; that Benedict XII was Jacques Fournier, born at Saverdun in the county of Foix; that Clement VI was Pierre Roger, born at the castle of Maumont in the diocese of Limoges; that Innocent VI was Etienne d'Albert, born near Pompadour in the diocese of Limoges; that Urban V was William Grimoald, born at Grisac in Gevaudan, diocese of Mende, and that Gregory XI, nephew of Pope Clement

VI. Like his uncle, who died at Avignon in the diocese of Limoges. These three Popes, who resided in the sacred college of cardinals, and particularly the French cardinals, would have called Italian architects to build the palace is scarcely probable; but if they had invited them, it would have been impossible not to resort to the services of the palace of the Popes at Avignon as belonging to the

architectural of the ancient province of France. We must, on this point, observe that the palace of the Popes is one of the finest specimens of the architecture of the 14th century, and it is not only a masterpiece of French architecture, but it is also a masterpiece of the architecture of the 14th century.

As to the palace of the Popes, it is a masterpiece of the architecture of the 14th century, and it is not only a masterpiece of French architecture, but it is also a masterpiece of the architecture of the 14th century.

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Vi, like his uncle, was born at Maumont in the diocese of Limoges. That these Popes, who admitted in the sacred college a great number of French prelates, and particularly Gascons and Limousins, would have called Italian architects to build their palace is scarcely probable; but if they had invited them, that it would however be impossible not to regard the structures of the palace of the Popes at Avignon as belonging to the architecture of the southern provinces of France. We insist on that point, because it is a prejudice commonly established, that the palace of the Popes is one of the grandiose structures belonging to the arts of Italy, and it is neither by grandeur nor by freedom, that it is distinguished. The Popes established in France, possessors of a rich county, collecting considerable resources, living comparatively in a state of profound peace, all being from these dioceses of the South, then so rich in monuments, have built at Avignon a work absolutely French, much superior in general conception, grandeur and taste to what was then erected in Italy. Let us now examine this vast edifice in all its parts. We shall take the palace of the Popes at Avignon as it existed at the end of the 14th century, i.e., after the successive restorations made from Clement V to Gregory XI, for it would be difficult to give the transformations of the various services composing it, and to show, for example, the palace built by John XXII. These immense structures rise on the southern slope of the rock of Doms and opposite the Rhone; so that the ground story of the adjoining part of the Church of Notre Dame, which is the oldest, finds itself on the level of the second story of the part of the buildings last erected on the south side by Urban V. If we then trace the plan of the ground floor of the palace of the Popes at its lowest part, we shall come into the solid rock by advancing to the North. (Fig. 14).

The entrance of honor A opens on an open space dominating the surroundings, formerly divided in several courts with curtains, tower and gates. That entrance A is defended by two portcullises, door leaves and a double machicolation. Before it and opening on the area, the advanced work was replaced in the 17th century by a wall for counter-guard with battlements. Beneath the entrance vestibule at the right is the doorway opening into a great vaulted guardroom. From the court of honor

One can go to all parts of the palace. From the vestibule  
one can go to the hall G, or also the hall H. By the passage  
one descends to the eastern staircase I, from which one enters  
the hall K beneath the great tower L and its annex J. By the  
little gate passage O one enters the great hall W, which serves  
as a court and communicates with the open spaces by a  
staircase P. At R is a passage leading to inside machicolations,  
a portcullis and folding door; at S is a second passage def-  
ended by machicolations and a portcullis; at T a flight of  
steps ascends to the ground story of the part of the palace  
built on the rock at a level above the ground of the court of  
honor. The lowest portion of the palace, the tower of the  
tower of the palace; this is the keep, of which we see here  
only the upper part. A series X serves as part of the en-  
trance and descends to the ground of the esplanade, giving  
entrance on the wall of defense R furnished with machicolations  
one and a defensive gallery. At Y one sees again this wall  
is a defense.

All this ground story is vaulted and built in a manner to  
last time and the end of man. From the staircase S one as-  
cends by a narrow stair to the upper defense of the principal  
wall. The tower of the palace is a tower of the principal  
wall of the palace.

As one can recognize, the arrangement of the ground story  
is solid, because from the court of honor one directly reaches  
all parts of the palace. Let us also note that the two por-  
tals R and S are placed in resistant walls, well marked and  
defended; that the front and flank, and that the machico-  
lations are placed by the natural arrangement of the rock to  
establish solid structures. Towers extend on the southern side  
as on a sort of projection forming a hill. At one side (toward  
the north) the rock of the tower is vertical on the slope, and it  
was further defended by a fort (St. Martin). At the other (tow-  
ard the south) it is placed in the middle of the city, and  
this divides it into two parts. Toward the west, the court  
extends to the principal palace, and were occupied by the famo-



One can go to all parts of the palace. From the vestibule D he ascends to the upper story by a broad and beautiful stairway in two flights, where indeed he enters the great lower hall E and its annex F, or also the hall G. By the passage H he descends to the eastern esplanade I, from which he enters the halls K beneath the great tower L and its annex l. By the little bent passage O he enters the great hall M, which serves as a post and communicates with the upper defenses by a stairs P. At R is a postern defended by inside machicolations, a portcullis and folding doors; at S is a second postern defended by machicolations and a portcullis; at T a flight of steps ascends to the ground story of the part of the palace built on the rock at a level above the ground of the court of honor. The oldest portion of the palace, the tower of Trouillas is at V, flanking the rock, and rising above all the other towers of the palace; this is the keep, of which we see here only the substructure. A stairs X serves this part of the buildings and descends to the ground of the esplanade I, giving entrance on the wall of defense Z furnished with machicolations and a defensive gallery. At N and set against this wall is a bakehouse.

All this ground story is vaulted and built in a manner to defy time and the hand of man. From the guardroom B one ascends by a screw stairs to the upper defenses of the principal gate A. Another stairs C ascends to the apartments looking over the esplanade.

As one can recognize, the arrangement of the ground story is good, because from the court of honor one directly reaches all parts of the palace. Let us also note that the two posterns R and S are pierced in reentrant angles, well masked and defended; that the fronts are flanked, and that the architects have profited by the natural arrangement of the rock to establish their structures. Gardens extend on the southern side on a sort of projection forming a hill. At one side (toward the North) the rack of Doms is vertical on the Rhone, and it was further defended by a fort (S. Martin). At the other (toward the south) it is planted in the middle of the city, and thus divides it into two parts. Toward the west, the courts extend to the episcopal palace, and were stopped by the rampart of the city, which descended to the bank of the Rhone and





joined fort S. Martin.<sup>1</sup> Flights of steps arranged beside that fort descended to the gate of the little cloister giving entrance to the bridge S. Benezet, that crosses the Rhone (Art. Pont). On the east the precipice is abrupt and dominates the streets of the city. The site of this palace was then wonderfully selected to hold the city in dependance or under protection, to watch over the banks of the river just at the point where it forms quite an abrupt bend, to be in communication with the enclosing wall, and at need to leave that city without being seen.

Note 1.p.31. This fort was destroyed in 1650 by the explosion of the powder magazine contained in it.

To multiply illustrations, we present the plan of the palace of the Popes in the ground story for the highest portion, and on the second story for the buildings situated above the buildings enclosing the court of honor. In fact the level of the ground story of the upper buildings corresponds to the level of the mezzanine story partly arranged on the plan given in Fig. 14.

At A (Fig. 15) is the church Notre Dame des Doms, rebuilt in its original form and before the addition of the chapels, that changed the plan of that beautiful edifice. Erected during the 12 th century, the church Notre Dame des Doms, today still the cathedral of Avignon, was retained by the Popes, and in its vicinity the pontiffs erected the first structures of their palace, among others the towers B and the hall b. Advancing gradually toward the south, and following the slope of the rock, the Popes at first closed the court C, surrounded by a wide portico with a story above it, and then the court of honor D. It is to be noted that in erecting each tower and each structure, they were fortified, so as always to protect from attack the completed portions of the palace. Thus for example, the building E was defended by machicolations at e, b because at the time of its construction it had a direct view outside, the court of honor D and the great hall G having been built last, as well as the tower H.

Under Urban V the apartments of the Pope were in the second story around the court of honor. A great hall (the hall G) was entirely vaulted and served as a chapel. Its vaults were covered by beautiful paintings, of which there remain only frag-





fragments. The stairway of honor I gave admission to that chapel and to the apartments of the lodgings at west and east. A service corridor extended beside the rooms in the western wing, reached by the stairs K, communicating with the porter's lodge and the upper defenses by the screw stairs L, ending over the postern P, and placing the western wing in communication with the lodgings E. Battlements with wide machicolations bordered the chambers of the western wing outside, at the level of the second story. At F were placed in the second story the great kitchens II.<sup>1</sup> The festal hall was over the hall b, and was separated from the galleries of the cloister by a very narrow and very long court; one will note that machicolations defended the foot of the four buildings around that cloister. Partitions are not inserted in the plan because they have been changed several times in locations, divided the lodgings surrounding the cloister and left service corridors. This vast palace was then very habitable, all rooms being lighted, at least on one side. One will also note that in the thickness of the walls in particular are constructed service passages and stairs that connect the different stories, and that can aid the defense if necessary. An elevation made of the entire extent of the western facade will exhibit the entirety of this majestic palace (Fig. 16), that dominates the city of Avignon, the course of the Rhone and the surrounding country. It was formerly richly decorated by paintings in the interior.<sup>2</sup> But two fires, abandonment and vandalism have destroyed the greater part of the decorations. Some quite richly painted ceilings date from the 16<sup>th</sup> century. The steps of the grand stairway, now dilapidated and mean, were made of marble or polished stone, and its vaults were painted. The chapel was most splendid and contained precious monuments; in this nave were deposited the trophies sent to the Pope in 1340 by the king of Castile, after the victory of Tarifa.

Note 1.p.33. Those are the kitchens, which are now shown as being a hall of execution with closed doors and a chamber of torture.

Note 2.p.33. There remain of those paintings only traces in the great chapel, and in two rooms of the tower now called that of Justice.

The two turrets that surmount the entrance gate in the form





28 watch towers were only destroyed in 1749, because they threatened ruin (according to a report of lord Thibaut, engineer, dated March 29 of that year); a painting deposited in the library of Avignon and several engravings have preserved their forms for us. As for the tops of the towers, particularly that of the tower of Trouillas, they were only completely destroyed at the beginning of this (19 th) century, and are likewise reproduced in paintings and engravings of the 17 th century. The palace of the Popes possesses seven towers that are: 1, the tower of Trouillas; 2, of Gache;<sup>1</sup> 3, of S. Jean; 4, of S. Laurent; 5, of the Bell; 6, of the Angels; 7, of the Estrapade.

Note 1.p.35. This name comes from the fact that it served as a watch tower (*guette*). From the top of the tower of Gache (nearest the facade of Notre Dame des Doms and the highest, see the facade), was given by the sound of trumpet the signal of the curfew, and the inhabitants were warned in case of fire or alarm.

The legates occupied the palace of Avignon after the departure of the antipope Benedict XIII, and they caused considerable works there, among others cardinal d'Armagnac in 1569; but that vast residence was very dilapidated and "very bad to occupy," as Ch. de Brosses stated in the last (18 th) century. Today it is with great difficulty that one can recognize the internal arrangement through the floors and partitions that intersect the stories, to lodge the multitude.<sup>3</sup>

Note 2.p.35. This is the tower situated between the gate and the great chapel. See facade.

Note 3.p.35. The emperor Napoleon III ordered during his journey to Avignon in 1860, the building of a barrack in the city, in order to clear and repair this magnificent palace.

The last example shows like the preceding, that the question of symmetry was not raised, when it was necessary to build the palace during the middle ages. Men sought to place the services according to the site or the most favorable orientation, according to the requirements, and gave to each building the form and appearance suited to its purpose.

All episcopal palaces in France did not have that fortress appearance. The archiepiscopal palace of Rouen, the episcopal palace of Evreux and that of Beauvais, almost entirely rebuilt in the 15 th century, greatly resemble those princely mansions





opening externally by broad windows, and no longer possessing towers for defense. As for the kings of France, from the end of the 14 th century, when they resided in cities they occupied mansions. The king possessed several mansions at Paris, and in most cities was the king's lodging, which often was a very modest residence. Castles were preferred, for one enjoyed greater freedom there. The troubles that filled a great part of the 15 th century induced the sovereigns to no longer trust themselves excepting to good walls at a distance from the city.

The castles of the Louvre, the Bastile, and of Vincennes, those on the banks of the Loire, became the habitual residences of the kings of France from the wars of independence until the reign of Francis I. The great vassals followed in that the examples of the sovereigns, and preferred their castles to their urban residences, and the name of palace remained for the buildings occupied by the parlements.

#### PALIER. Landing of Stairs.

A rest arranged between the flights of a stairway. (Art. Escalier.

#### PALISSADE. Palisade. Barrier.

An enclosure composed of piles driven into the ground and sharpened at their upper ends.

Many market-towns, villages and rural habitations, manors, barns, etc., during the middle ages were only enclosed by palisades. The dependances of castles, lower courts, gardens, and warrens, frequently had no defense but a palisade with a live hedge. (Old French poem). 1, 2

Note 1.p.36. Romans d'Alexandre; Combat de Perdiccas et d'Akin. Edit. of Stuttgart. 1846. p.140.

Note 2.p.36. The same; message o Dorius. p.254.

It was also customary to plant palisades at the foot of the ramparts of cities, so as to leave between the wall of the enclosure of piles a space serving as a defensive passage or lists, as were then termed such spaces. That was one means for preventing assailants from sapping the foot of the ramparts, when there were no ditches, to prolong the defense, and to allow the besieged to make sorties. When an army invested





a castle or fortified city, at first furious combats occurred to get possession of the palisades and the lists, so that the miners might reach the walls, or bring up their cats and rolling towers. (Old France poem). 3, 4, 5.

Note 3.p.36. Roman de Rou. Verse 2600.

Note 4.p.36. The same. Verse 2628.

Note 5.p.36. The same. Verse 7352.

Those wooden structures around places often had great importance; they formed actual barbicans, or defended long covered lodgements. The besieged did their best to preserve them, for these palisades forced the assailants to extend their lines, permitted the entrance of aid and provisions, and rendered the defense of the tops of the ramparts more efficient, because it swept a more extended field. (Arts. Architecture Militaire, Siege).

#### PAN DE BOIS. Half Timber Work.

A carpentry work composed of sills and plates, posts, braces and ties, forming actual wooden walls, either on the fronts of buildings or in the interiors, and then serving as partitions. Today in France it is forbidden to place half timber work on the public street, in great cities, in order to prevent the communication of fire from one side of the street to the other. For the same reason it is not permitted to build party walls of half timber work. But until the last (18th) century, the use of half timber work was very common, particularly in the cities of the North. Article Maison mentions a certain number of habitations with front walls entirely or partly of half timber work very happily combined. This means had the advantage of allowing superposition of corbelled stories, in order to leave a sufficiently wide passage on the public street and to gain area in the upper stories. It was economical and sanitary, for with equal thickness, a half timber wall better protected the occupants of a house from variations of external temperature than a wall of brick or stone. There is no construction more stable, durable and lighter. Thus men still habitually use half timber work in the interiors and courts, but instead of leaving it visible, as always practised during the middle ages, it is covered by plastering, that scarcely fails to heat the timbers and to cause them to decay;





but one simulates thus a construction of stone or at least of rubble plastered.

One cannot give the name of half timber work to squared trunks of trees piled horizontally; that sort of construction does not belong to the art of the carpenter; it is seen used only by certain peoples, and it was never adopted on the territory of France after the Gallo-Roman epoch. According to Cæsar, the Gauls erected some structures, notably defensive walls, by means of logs alternating with stones and cross logs; but it does not appear that this method was employed during the middle ages, and it has no relation to what we call half timber work.

Half timber work by its combinations indeed requires an already extended knowledge of the art of the carpenter, and is found only among peoples that have long practised that difficult art. The Romans were skilful carpenters and knew how in brief time to erect wooden structures of great importance. Employing short timbers as more convenient, they framed them together solidly, and they could at need raise them to great heights.<sup>1</sup> The peoples of the North, and especially the Normans, were excellent carpenters, added new elements to those antique traditions, as for example the use of timbers of great length and curved timbers, so frequently employed in naval carpentry; they adopted certain connections with joints of extraordinary strength, as for resisting the shocks and concussions to which ships are subjected, and they never had recourse to iron to connect their wooden structures.

Note 1.p.38. Italian carpenters, notably at Rome, have retained the antique traditions, and they erect today in a few hours scaffolds by means of short timbers of small dimensions. It is impossible to not recognize a perfect identity of means in these scaffolds and the carpentry represented on the reliefs of Trojan's column.

Lavish with a material not rare on the soil of Gaul, Romanesque architects, when they erected half timber work, left small space for the fillings, and freely used timbers at least very wide, if not very thick, cut from enormous trees, forming by their combination a heavy framework, scarcely leaving any spaces between them, except the openings necessary to light the interior.





Connecting by strongly pinned halving was one of those most frequently employed in those remote epochs. Thus were composed actual rigid panels, that entered into grooves in the sills and plates. Rarely in that epoch were corner posts placed at the angles, and the half timber work was set between the two end piers of masonry walls, that formed gable walls at the sides; in brief, the front half timber work of a house was only a front enhanced by bright colors outlined by wide black lines. It is well understood, that those structures preceding the 13 th century have long since disappeared, and scarcely in some old French cities were found any remains thirty years since; yet it is necessary to seek them under recent lathing, or to collect them during demolitions. Thus in 1834 at Dreux we could draw, while being torn down, the fragments of a house, that appeared to date at the middle of the 12 th century. The house was raised in the 15 th century, but only seems to have been composed originally of a great story, and a corbelled second story, with a garret. The old roof with an eave on the street no longer existed, and the garret story had been surmounted by a high wooden gable roof covered by wooden tiles. Of the old windows there remained only the lintels with internal gains indicating the passage of halved jambs.

Here (Fig. 1) is a view of this curious half timber work comprised between two walls forming corbelled ends. The sills, plates and posts were timbers about 7.5 ins. square, the jambs of the windows were 5.9 x 7.0 ins. The arch of the door was composed of two great timbers halved together and with the two jambs. The joists of the floors, like the sills of the half timber work, rested on the side walls and on a beam placed parallel to those walls about the middle of the facade. All that carpentry was framed with care, ornamented by some very simple mouldings and incisions of small depth. There were seen under the window sills of the attic remains of thick panels also ornamented by incisions. Fig. 2 presents the section of that half timber frame, and indicates the intermediate post A, reinforcing the front of the ground story and bearing by means of a strut B the transverse beam C, that relieves as much the span of the sill D of the upper half timber frame. Above this strut B is set the post E extending up to the plate F, supporting another transverse beam G under the roof. The end of that

beam is relieved by a strut I. A plate F receives the ends of  
the rafters and the blocks K. The girder L is tenoned into a  
post G, which under the name of a scullion M (see fig-  
ure 10). This girder is further supported by a strut F, whose  
foot is tenoned into the final joint P of the floor of the se-  
cond story. The area (Fig. 1) shows not the form of the  
half almost frame bracket and leads to the intermediate post  
and the side walls by means of curved struts, which join the  
sides of the walls and the ends of the hollowed window lintels.  
First, I will explain the points of the little posts forming  
the faces of the windows and of the curved struts. We know  
one of these windows on the inside. The intermediate little  
posts G form windows, and relieved from these lintels, and be-  
ar at their upper ends a beam that enters a mortise cut under  
the sill. A little post also enters into the lintel and ke-  
eps that lintel with the post. The lintels A themselves have  
mortises that enter under the sill at G. The section C gives  
an elevation of these connections, and points of the half sim-  
ilar frame being at A. The little post G forming the jamb is  
likewise relieved into the end of the lintel, and bears its to-  
tal weight into a mortise; but the sill at I has a skew  
cut I, that enters the lintel, and a beam m that enters the  
mortise n. This beam also has a corner entering the end of  
the lintel at P.

The construction of this window reveals some points in  
joinery, and also those adopted for naval construction. The  
labor is considerable, as in all primitive structures; but  
one will observe that the work is not executed anywhere. Be-  
sides the volume of the window is enormous with regard to the  
small dimensions of this half timber frame; the fillings in  
masonry or clay are almost none. Already in the 13th cen-  
tury were erected half timber frames with light and better  
workmanship, in which the labor was economized, and that preser-  
ved the principle. The half timber frame of this window is  
rest on the half timber frame, and serve to connect it with  
the intermediate post G.

The window (Fig. 1) is one of those half timber frames, in-  
termediate to the end of the 13th century, as much as one  
can judge by the modifications. Here no side walls are of mason-  
ry, as in the primitive example; the construction is entirely



beam is relieved by a strut I. A plate H receives the ends of the rafters and the blocks K. The girder L is tenoned into the post E, which under that joint has a shoulder M (see detail O). This girder is further supported by a strut P, whose foot is tenoned into the first joist R of the floor of the second story. The view (Fig. 1) shows how the fronts of the half timber frame transfer the loads to the intermediate post and the side walls by means of curved struts, which join beneath the sills and at the ends of the hollowed window lintels. ~~of Fig. 3~~ well explains the joints of the little posts forming the jambs of the windows and of the curved struts. We show one of these windows on the inside. The intermediate little posts B form mullions, are halved into these lintels, and bear at their upper ends a tenon that enters a mortise cut under the sill. A little tongue also enters into the lintel and keeps that flush with the post. The lintels A themselves have tongues f that enter under the sill at g. The sketch C gives an elevation of these connections, the inside of the half timber frame being at h. The little post G forming the jamb is likewise halved into the end of the lintel, and bears its tenon i dropping into a mortise j; but the strut E has a skew cut l, that abuts the lintel, and a tenon m that enters the mortise n. This tenon also has a tongue entering the end of the lintel at P.

The connections of this carpentry recall those employed in joinery, and also those adopted for naval construction. The labor is considerable, as in all primitive structures; but one will observe that ironwork is not admitted anywhere. Besides the volume of the timber is enormous with regard to the small dimensions of this half timber front; the fillings in masonry or mud are almost nothing. Already in the 13<sup>th</sup> century were erected half timber frames much lighter and better combined, in which the labor was economized, and that presented perfect stability. Frequently at that epoch the floor beams rest on the half timber front, and serve to connect it with the internal half timber partitions.

We will trace (Fig. 4) one of these half timber frames, which belongs to the end of the 13<sup>th</sup> century,<sup>1</sup> as much as one can judge by the mouldings. Here no gable walls are of masonry, as in the preceding example; the construction is entirely

is carpenter, and the party walls are half timber frames com-  
posed of sills, posts, gables and braces. The two stories of  
half timber frame are separated by a third story, as indicated  
by the section A. The corner and axial posts of the facade  
are 8.7 and 9.4 ins. square; all the others are also 8.7  
ins. square. The floor joists are 7.5 x 7.5 ins. The floor joists  
of the floors rest on the posts framed on the inside of the  
walls, and are supported by brackets and struts 7 ins. square and  
7 ins. diameter at their ends. The walls are 12 ins. thick  
except those above the ground floor which are 14 ins. thick.  
The reserve weaker beams or narrow joists on which are laid the  
boards with floor strips, spaces and sills. The spacing of the  
half timber frame is prevented by wide stone braces 8 and  
X-braces below the sills of the windows. A detail (Fig. 2) of  
the connection of the sills to the stone braces is shown.  
The sills and corbels of the ground floor are connected with the beams  
at the ends of the sills and are cased into the ends of  
the beams, and now between these cases are set intermediate  
solid blocks. The perspective sketch shows one of the  
connections of the sills to the stone braces.  
The section of the first floor and its connection with  
the post forming the frame. As for the elevation B, it ex-  
hibits the connection marked b in Fig. 1.  
Note 1. p. 48. From a house at Clatworthy.  
This half timber frame is well drawn; the timbers are per-  
fectly square, the moldings cleanly cut, the joints made  
with care. It is well understood to have been visible; the  
timbers are well cut and the joints are clean.  
We have elsewhere mentioned the skill of the carpenter  
of the middle ages, chiefly during the 14th, 15th and 16th  
centuries. It is unnecessary to believe that construction was  
then restricted to the use of half timber work for the houses  
of the ordinary; on the contrary half timber work was a kind  
of construction often adopted even in public edifices, palaces  
and castles. In many French residences the ceilings and in-  
terior, or as division walls, half timber framework. We have fre-  
quently proved the existence of these carpentry works, frequently  
in the form of a ceiling or a certain partition. Half timber  
work was also employed as a temporary means for enclosing ab-  
bays, before they were the line to which, or some other



in carpentry, and the party walls are half timber frames composed of sills, posts, struts and braces. The two stories of half timber front are corbelled beyond each other, as indicated by the section A. The corner and axial posts of the facade B are 8.7 and 9.4 ins. square; all the others and also the sills and floor beams are only  $6.7 \times 7.5$  ins. The floor beams C of the floors rest on the plates framed on the heads of the posts, are relieved by gussets and corbels D inside and outside, and can thus receive at their ends the sill of the story above. These floor beams being spaced about 3.3 ft. on centres receive weaker beams or rather joints on which are laid the boards with floor strips, space and tiles. The swaying of the half timber frame is prevented by quite strong braces E and X-braces below the sills of the windows. A detail (Fig. 5) e explains the connection of the sills a with the posts b, gussets and corbels c, either with these posts or with the beams e. One sees at g how the sills h are boxed into the ends of the beams, and how between these beams are set intermediate moulded blocks i. The perspective sketch f shows one of the beams separated and its mortises; the perspective sketch l represents the lintel m of the door and its connection with the post p forming the jamb. As for the elevation B, it explains the connection marked b in Fig. 4.

Note 1.p.42. From a house at Chateaudun.

This half timber frame is well drawn; the timbers are perfectly squared, the mouldings cleanly cut, the joints made with care. It is well understood to have been visible; the fillings were made with mortar and little rubble plastered.

We have elsewhere mentioned the skill<sup>2</sup> of the carpenters of the middle ages, chiefly during the 13<sup>th</sup>, 14<sup>th</sup> and 15<sup>th</sup> centuries. It is unnecessary to believe that construction was then restricted to the use of half timber work for the houses of the citizens; on the contrary half timber work was a kind of construction often adopted even in public edifices, palaces and castles. In many feudal residences the buildings had inside, or as division walls, half timber framework. We have frequently proved the presence of these carpentry works, destroyed by fire, in castles of a certain importance. Half timber work was also employed as a temporary means for enclosing edifices, which there was not time to complete, or whose const-





construction was suspended. Thus one sees at the top of the north wall of the cathedral of Amiens a gable in half timber work, that dates from the 14 th century.

In certain provinces where wood was abundant and stone rare, even churches were built entirely of wood. One still sees in one of the suburbs of the city of Troyes <sup>1</sup> a chapel placed under the name of S. Gilles, that is built of half timber work that dates from the second half of the 14 th century. That edifice, from which recent additions have taken part of its character, consists of a single nave still entire, and terminated by an apse of four sides. We give (Fig. 6) at A the plan and at B the cross section of the chapel of S. Gilles.<sup>1</sup> The entire system consists of a series of posts (one for each bay and at each angle) resting on a sill and supporting the trusses; a plate connects the tops, and two rows of ties with braces and little posts keep them upright. The tiebeams and kingposts of the carpentry are visible; that is ceiled. One spire of which a part is traced at D crowns the roof on the third bay, narrower than the others. Fig. 7 gives at A the geometrical detail of the connection of the parts with the tiebeams and the double braces that relieve them, and at B the perspective sketch of one bay of the interior with the window, the plate and the moulded upper ties. One sees how in that humble edifice the carpentry is treated with care, how the decoration on the whole is only the appearance of the construction. On this woodwork is no plastering on laths imitating stone construction; thus this carpentry left to the free air on two surfaces has been preserved for more than four centuries. One will note that the braces C (Fig. 7) are intended less to relieve the tiebeams of the trusses than to prevent the canting of the half timber work. They take the place of angles or gussets, that prevent the entire system from swaying to one side or the other.

Note 1.p.45. Suburb Gronceus.

Note 1.p.46. M. Millet, diocesan architect of Troyes, has kindly furnished us the drawings of this little edifice.

After the 13 th century the timbers employed in half timber work are never very large; they are sound and are chosen from trees not too old. They are nearly always squared from a single trunk and consequently of small diameter. These good tra-

positions were retained till the beginning of the 17th century, since the practice of burning houses mentions them. The houses were built with half timber work and that was well known and made of selected wood.

Note 1. p. 47. Le Treuve de l'art de charpenter, etc., by Martin Jousse de la Pléche, 1627.

Principally in the provinces of the East and approaching the Rhine, we find remains of half timber construction of houses of the 16th century. The houses were built in these recent times worked as larger houses than most of those seen in our cities of the royal domain. At Gonesse an excellent example of half timber work. Many of these houses of Gonesse were built from the end of the 14th and the 15th centuries and defensive days at the angles; they were built and built. Let us see how are generally combined the half timber from the view the angle posts (Fig. 8). The front of the bay forms an angle of 45° with the ground and the corner posts are taken at the level of the bay. At B is a corner post that rises from the bottom and from the side to the plate C. To this corner post is fastened the roof at the middle of the front of the bay. The angle posts of the bay are diagonal and rest on the beams b b', whose overhangs are supported by the plates e. At the level of each floor the bay is connected to the principal structure by the floor beams (see the second plan D taken at the level d). The ends of the corner posts of the bay receive the two horizontal plates in such a way that they take the plates e (see the plan E of the last figure, taken at the level f). A little shed roof of planks covered by glass or shingles is set on blocks f, with the lower part of the bay and serves as a shelter. This sort of construction gives much comfort to the houses by protecting the upper cover as the walls of the upper floor beams. This construction presents the advantage of the half timber work of the front, their ends being held between two plates or "collar-plates," as were called those horizontal timbers.

The connection of the posts C at the middle of the front of the bay with the roof beams is made by a single piece (Fig. 9) is shown in the plan of the house. The bay is shown in the plan of the house.



traditions were retained till the beginning of the 17<sup>th</sup> century, since the treatise of Mathurin Jousse mentions them;<sup>1</sup> indeed there still exist some half timber works of that epoch, that are well hewn and made of selected wood.

Note 1.p.47. Le Traicté de l'art du charpentier, etc., by Mathurin Jousse de la Flèche 1627.

Principally in the provinces of the East and approaching the Rhine, we find remains of half timber structures of great dimensions. Strasburg has retained in these recent times wooden houses at larger scale than most of those seen in our cities of the royal domain. At Constance exist important public edifices in half timber work. Many of those houses of Strasburg, which date from the end of the 14<sup>th</sup> and the 15<sup>th</sup> centuries had defensive bays at the angles; they were large and high. Let us see how are generally combined the half timber front with the angle bays (Fig. 8). The front of the bay forms an angle of 45° with the front of the house (see the first floor plan A taken at the level *a*). At B is a corner post that rises from the bottom and from the sills to the plate S'. To this corner post is fastened the post C at the middle of the front of the bay. The angle posts E of the bay are diagonal and rest on the beams *b b'*, whose overhangs are supported by the braces *e*. At the level of each floor the bay is connected to the principal structure by the floor beams (see the second plan D taken at the level *d*). The heads of the corner posts of the bay E receive the two horizontal plates *h* into which are tenoned the plates *g* (see the plan F of the last layout, taken at the level *f*). A little shed roof of planks covered by slates or shingles is set on blocks *i*, holds the lower part of the bay and serves as a shelter. This sort of construction gives much comfort to the houses by permitting one under cover to see the length of the street. The lateral framework supported the transverse beams on which rest the floor beams. Thus those presented the inclination of the half timber work of the front, their ends being held between two plates or "columbelles," as were called those horizontal timbers.

The connection of the posts C at the middle of the front of the bay with the great corner posts B merits being detailed. The diagonal post B rising from the bottom (Fig. 9) is strongly chamfered on its corner forming the external angle, as ind-

... of the middle post of the bay. On the opposite side of the bay ... of the corner post. On that is fixed the block V by means of an art mortise, and it is further held by a tension a rising into the mortise N. That block V receives in a mortise a tension of of the post Q, and in two other mortises the tension of the post R. The block V also supports the little timber forming the end roof. Posts Q and R are placed in the corner post S and in the post G at certain distances, and these two posts support the other connections of the wall. Timber connections are easy to understand and do not require explanation.

About the middle of the 15th century was adopted a system of half timber construction that presented great advantages, and which rendered complex workmanship. It consisted of a lattice of timber beams, and the four half timber frames, that after the building of the cathedral of Bourges in 1411 were intended to support a nave in oak timber. That was never executed. About the middle of the 16th century the half timber houses of private houses were built on this system, which was followed until Louis XIII. Also then were constructed half timber frames called "châsses de boiseries," as indicated by Mathurin Jousse in his work published for the first time in 1627. Several houses in Paris and Orleans still show half timber houses so constructed, and that presents great difficulties because they have acquired perfect rigidity. It is necessary then to these works, and before half timber works disappeared and have only a very limited duration.

... of roofs and intended to support the rafters. These roofs had a lattice and timber frame of a series of beams, rafters, and purlins. They are without ornament. (Art. Châsses). Yet in the use of purlins became common when men had to economize in timbers of great length.



indicated at O. A block P on that corner is arranged in the solid below the chamfer, that has the width of one of the sides of the middle post C of the bay. On the support P is placed the strut M whose two tongues are inserted in the two mortises of the corner post. On that is fixed the block N by tenon and mortise, and it is further held by a tenon n rising into the mortise n'. That block N receives in a mortise a the tenon e' of the post C, and in two side mortises the tenons of the girth S. The block N also supports the little rafter forming the shed roof. Dowels G of hard wood are pinned in the corner post B and in the post C at certain distances, making these two posts stable. All other connections of the half timber construction are easy to understand and do not require explanation.

About the middle of the 15th century was adopted a system of half timber construction that presented great strength, but which required complex workmanship. It consists of a lattice of timbers halved together so as to form a series of lozenge shapes. Thus are arranged the four half timber frames, that after the burning of the carpentry of the cathedral of Rheims in 1431 were intended to support a spire in carpentry, that was never erected. About the middle of the 16th century the half timber fronts of private houses were built on this system, which was followed until Louis XIII. Also then were constructed half timber frames called "brins de fougere," as indicated by Mathurin Jousse in his work published for the first time in 1627. Several houses in Rouen and Orleans still show half timber facades so combined, and that present great stability because they have acquired perfect rigidity. If one compares them to these works, our modern half timber works plastered are very rude and have only a very limited duration.

#### PANNE. Purlin.

A timber in carpentry placed horizontally on the principals of roofs and intended to support the rafters. Most roofs built during the middle ages consist of a series of trussed rafters, consequently are without purlins. (Art. Charpente). Yet in certain cases the carpenters of that epoch made use of purlins. The use of purlins became common when men had to economize timbers of great length.

THE TEMPLE OF VENUS AND ADONIS.

The temple of Venus and Adonis is situated on the left bank of the river, and is one of the most important remains of the city. It is a large building, and is composed of several parts. The main part is a large hall, and is surrounded by a colonnade. The colonnade is composed of several orders of columns, and is supported by a series of piers. The piers are of different heights, and are decorated with various ornaments. The roof of the temple is made of stone, and is supported by a series of beams. The temple is in a state of ruin, and is surrounded by a wall. The wall is made of stone, and is decorated with various ornaments. The temple is a fine example of the architecture of the city, and is one of the most important remains of the city.

THE TEMPLE OF VENUS AND ADONIS.

We shall not discuss the more or less important evidences that may have produced this work. By "evidence" is called an enclosed area often raised above the surrounding soil, a sort of platform before the facade of some Greek churches. Note the Dome of the Rock, and the Dome of the Umayyads in Syria. Some classical churches, especially the dome of the Hagia Sophia, but the latter had a special character. This yard is evidently a tradition from antiquity; the form of the Greek was radically created by a connection of area, whose enclosure was only a barrier with the aid of a wall.

The Romans followed this example, and we see on a relief upon the occasion of the erection of the temple of Antonine and Faustina in Rome, the temple of the goddess Minerva is represented a barrier with a gate. These enclosures were to the temple that should surround every religious edifice, by isolating their entrance and separating them from the rest of the public street. One of the most remarkable yards of the city is the yard of the temple of the goddess Minerva, which is enclosed by a wall with a gate. The wall is made of stone, and is decorated with various ornaments. The gate is made of stone, and is decorated with various ornaments. The yard is a fine example of the architecture of the city, and is one of the most important remains of the city.

Note 1. The temple of the goddess Minerva, and the temple of the goddess Venus, and the temple of the goddess Adonis.

The first Christian church (likewise possessed a court surrounded by porticoes before their facade, and in the middle of the wall were placed statues, and in the middle of the wall were placed statues.

The yard of our cathedral is only a variety of these yards; but the French cathedral after the end of the 12th century shows itself as an accessible monument made for the use of all people, and the yard of the cathedral is a fine example of the architecture of the city, and is one of the most important remains of the city.



### PARPAING. Through-stone.

Said of a stone forming the thickness of the wall. During the middle ages men rarely employed these stones. Nearly all cut stone walls are composed of stretchers and headers. The stones A (See Fig.) are stretchers, stones B are headers; stones C are through-stones. (Art. Construction).

### PARVIS. Yard before Church. Churchyard.

We shall not discuss the more or less ingenious etymologies that may have produced this word. By "parvis" is called an enclosed area often raised above the surrounding soil, a sort of platform before the facades of some French churches.

Notre Dame of Paris, and Notre Dame of Rheims possessed their yards. Some monastic churches sometimes had yards before their facades, but the latter had a special character.

This yard is evidently a tradition from antiquity; the temples of the Greeks were habitually preceded by a consecrated area, whose enclosure was only a barrier with the height of a sill.

The Romans followed that example, and we see on a medal struck on the occasion of the erection of the temple of Antonine and Faustina at Rome,<sup>1</sup> the facade of the monument before which is represented a barrier with a gate. These enclosures added to the respect that should surround every religious edifice, by isolating their entrance and separating them from the traffic on the public street. One of the most remarkable yards of the Roman epoch is that which Hadrian erected before the temple of the sun at Baalbec. That yard was enclosed by porticos with covered exedras, and was preceded by the front court with six sides with a peristyle and broad flight of steps.

Note 1. p. 51. Diva Faustina; on the reverse Aeternitas. Around the image of the temple, S. C.

The first Christian basilicas likewise possessed a court surrounded by porticos before their facades, and in the middle of that court were placed some consecrated monuments, tombs, wells, fountains and statues.

The yard of our cathedrals is only a vestige of these traditions; but the French cathedral after the end of the 12th century shows itself as an accessible monument made for the city and open to all assemblages; thus the yard no longer is

has a simple boundary that does not enclose; properly speaking, it is only a platform occupied by men and slightly raised works, no longer considered an obstacle to the circulation; it is the same whether the circulation is horizontal or vertical.

In the realization of the plan, the architect has to take into account the following points:

These factors on which were based the design, and that have defined the city by their contrast: fixings on the pavement, signs of the very certain distinction between the two elements, also on the part where the program has been on certain occasions, and where the character of an inferior order remained while the character remained the same from the external aspect of the facade.

It has not very vague suggestions concerning the form of the old yard of Notre Dame of Paris. In the 18th century it was constituted of a little oval wall with three entrances, one on each side the central and opening facing the canal of St. Martin. The wall at the left corner had the facade of St. Martin. The right wall was not over 4 ft. high. The ground level of the yard was at the level of the internal floor of the church, where the wall was at the level of the ground. From the yard one descended to the level of the river by a flight of 18 steps. This descent was the subject of the criticism of the critics of the 18th century. The descent was the subject of the criticism of the critics of the 18th century. The descent was the subject of the criticism of the critics of the 18th century.

It is to be believed that on the left side the facade was (now marked), one also descended several steps to reach the ground level. The descent was the subject of the criticism of the critics of the 18th century. The descent was the subject of the criticism of the critics of the 18th century. The descent was the subject of the criticism of the critics of the 18th century.

Note 2. p. 51. See plan of Notre-Dame on wood added to the sketches of Belle-forest: the plan of Notre-Dame; the topography of the city wall, and the entrance of the facade of Notre-Dame.

Note 1. p. 52. It has been able to find at several places the foundations of that enclosure. Roman remains exist beneath the entire area of the present square, directly beneath the door-



but a simple boundary that does not enclose; properly speaking, it is only a platform bounded by open and slightly raised works, no longer opposing an obstacle to the multitude; it is an area reserved for episcopal jurisdiction before the mother church.

In the enclosure of the yard the bishops caused to be erected those ladders on which were exposed the clerics, who had scandalized the city by their conduct; likewise on the pavement slabs of the yard certain blameworthy persons made atonement. Also on the yard were brought the relics on certain occasions, and where the clerics of an inferior order remained while the chapter intoned the Gloria from the external gates of the facade.

We have but very vague statements concerning the form of the old yard of Notre Dame of Paris. In the 16<sup>th</sup> century it only consisted of a little base wall with three entrances, one opposite the portals and opening beside the chapel of S. Christophe; that at the left opening near the facade of S. John the Round, and the third being opposite the descent to the Seine.<sup>2</sup> This base wall was not over 4 ft. high. The ground level of the yard was at the level of the internal floor of the church, except at the left side near the portal of the Virgin, where it was 1.0 to 1.3 ft. lower.<sup>3</sup> From the yard one descended to the bank of the river before the construction of the bridge by a flight of 13 marble steps. This causes the supposition that before the facade of the church extended a flight of 13 steps. It is to be believed that on the side next the Marche Neuf (new market), one also descended several steps to reach the public street, that passed between the hospital Hotel-Dieu and the chapel of S. Christophe, but that flight of steps must have been removed after the 14<sup>th</sup> century, since then mounted persons could reach the pavement of the yard. The enclosure was about 114.8 ft. wide by the same length.<sup>1</sup>

Note 2.p.51. See plan of Paris engraved on wood added to Recherches de Belle-Forêts; the plan of Merion; the tapestry of the city hall, and the engraving of the facade of Notre Dame by Van Merlen.

Note 3.p.51. That old pavement was discovered in 1847.

Note 1.p.52. We have been able to find at several places the foundations of that enclosure. Roman remains exist beneath the entire area of the present square, directly beneath the pave-

of the ground floor of the building.

of the ground floor of the building.

The yard of the cathedral of Reims was much less extensive than that of Notre Dame of Paris, and remained entirely within the enclosure of Louis XVI. It was a courtyard enclosed by a

building of which remains along the external entrance as a part of the plan. The plan of the

yard is shown in the plan, fig. 1. It was not a

of the cathedral of Reims, and the ground floor of the

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of the cathedral of Reims, and the ground floor of the



pavement; this proves that the level of the ground was at the level of the pavement of the church.

The yard of the cathedral of Rheims was much less extensive than that of Notre Dame of Paris, and remained entire until the consecration of Louis XVI. It was a charming enclosure, a fragment of which remains along the external buttress at the left of the facade. Drawings and engravings of that enclosure still exist and permit us to restore it. The plan of the yard of Notre Dame of Rheims does not present a parallelogram but a trapezoid, as shown by the plan, Fig. 1. It was not elevated above the ground of the public street, like the yard of the cathedral of Paris, and the grand flight of steps ascending to the portal was placed inside the enclosure before the buttresses. The cut-off corner H (see plan) was arranged to facilitate access to the entrance of the cloister, located at the north side of the nave.

The railing consisted of little piers bearing a rail with pinnacles at the entrances and the angles, i.e., at B. We give at C the detail of this exterior of the enclosure and at D its return. The two pinnacles B' at each side of the principal entrance were surmounted by supports with shields of arms; cross-flowers G terminated the other pinnacles.

The yard of the cathedral of Amiens has been removed; but its railing, if one were ever built, has not existed for a long time.<sup>2</sup>

Note 2.p.52. This yard has become inaccessible and must soon be restored.

The yards of monastic churches with facades looking on a public square were often established below the external ground; such was the yard of the abbey church of S. Denis.<sup>3</sup> The abbey church of S. Radegonde at Poitiers has still retained that very old arrangement, but restored about the end of the 15th century. Fig. 2 presents a birdseye view of half the yard, the axis being at A. Two descents are opened at the front. The ground declines toward the portal of the church; two other entrances are made on a level at the sides. Figures of kneeling angels holding shields of arms surmount the side walls of the two front entrances toward the outside. Animals, dogs and lions furnish the angles of the lateral entrances and the inner ends of the side walls of the front entrances. a H

higher part with itself presents itself on the axis. A section on (Fig. 2) made of one of the lower (thinner) gives the detail of the arrangement of these enclosures. Bones were arranged to the entire enclosure. The axis of the axis was placed with some axis, and the water ran away through lateral exits. Note 8.10.52. We have found traces of the presence of this axis, in the time of August.

It is unnecessary to exaggerate the momentary effect of an axis enclosed areas before the enclosure. Sometimes as before the control of the body of the body, a second axis was placed at the middle of the axis; bones were built within the enclosure. These arrangements, like most of those before, led to the diversity of the enclosure or body of the axis, were covered by the axis and enclosures during the last (10 and 11) years. These axes were arranged to enclose for a period during days of rain, and then were soon covered by permanent walls. For some reason, the diversity of the enclosure and enclosures this altered the diversity of the axis; they first raised the axis, and then the axis was raised to the level of the axis at moments.

#### PAVING. PAVING. PAVING.

A little part in the form of a circle placed beneath the axis, and the axis was raised to the level of the axis, and the axis was raised to the level of the axis.

#### PAVING. PAVING. PAVING.

The paving of the public squares, squares, squares of squares, is a work that is not seen to be undertaken, except in a civilised state. As all know, the squares had great attention to having the streets of cities, and everywhere that they were not are found those great hard stones, granite, sandstone, lava and basalt, set irregularly by a hammer, and forming a layer of concrete a very uniform surface with a non-uniform appearance. These pavements were established to last for several centuries, and indeed served during the first time in the middle ages. Not being renewed or even maintained, they gradually deteriorated and were filled to close the spaces, disappearing under a thick layer of mud and dust. The



higher part with shield presents itself on the axis. A section (Fig. 3) made of one of the front flights gives the detail of the arrangement of that enclosure. Benches were attached to the entire enclosure inside. The area of the yard was paved with stone slabs, and the water ran away through lateral exits.

Note 3.p.52. We have found traces of the pavement of this yard, to which one evidently descended from an early epoch, i.e., in the time of Suger.

It is unnecessary to emphasize the monumental effect of those enclosed areas before the churches. Sometimes as before the portal of the abbey church of Cluny, a stone cross was erected at the middle of the yard; tombs were built within the enclosure. These arrangements, like most of those belonging to the dignity of the cathedral or abbey church, were removed by the abbots and chapters during the last (13<sup>th</sup>) century. These areas were abandoned to dealers for a rental during days of fairs, and then were soon covered by permanent stalls. For some rentals, the clergy of the cathedrals and abbeys thus alienated the property of the church; they first raised the hammer against all that should inspire respect for consecrated monuments.

#### PATIENCE. Miserere.

A little seat in the form of a corbel placed beneath the movable seat of the stalls, and serving as a support when that is raised. (Art. Stalle).

#### PAVAGE. Pavement. Paving.

The paving of the public streets, squares, courts of palaces, is a work that is not seen to be undertaken, except in a civilized State. As all know, the Romans paid great attention to paving the streets of cities, and everywhere that they sojourned are found those great hard stones, granite, sandstones, lava and basalt, set irregularly by a rammer, and forming on a layer of concrete a very uniform surface with a monumental appearance. These pavements were established to last for several centuries, and indeed served during the first times in the middle ages. Not being renewed or even maintained, they gradually deteriorated and were filled to close the deepest holes, disappearing under a thick layer of mud and dust. The

series of the half-tonnage during the following  
the period retained well or badly the antique pavements, and  
the streets were obstructed, and pavements were broken, and  
these streets only formed ancient squares. Yet already in the  
12th century were paved certain squares or fragments of streets.  
We have sometimes discovered remains of these pavements, in  
particular in the 12th century, and in the 13th century.

Note 1. p. 55. In the city of Paris at present, 1870.

Paris August passed for having paved the streets of Paris  
with great blocks of granite. William the Conqueror's reign  
was with pavements was made of very large square stones. There  
is no trace of that pavement. But a few years since  
the fragments of the 12th century pavement were uncovered to red-  
dust the debris of the 12th century, there were removed under a large  
quantity of paving blocks of granite placed about 1.2 ft.  
below the existing surface. These blocks were about 1.2 ft.  
square and 0.7 ft. thick. Very much more on their upper sur-  
faces. They must have served for a very long time, and they  
probably dated from the epoch of the construction of the 12th  
century (and of the 13th century). During the 12th and 13th  
centuries were often employed for paving the streets and  
streets, squares and squares. These pavements were made of a  
set of stones, as still observed in some cities of the Seine  
of France, notably at Paris. At Paris, the 12th century  
was received on this system in an enormous quantity of stones.  
The 12th century was paved, the streets were paved with  
of stones set on edge. We have found pavements of that kind

Secret of History of France. Vol. I. p. 55.

The lower series of stones were often paved, and there was  
as still seen a few years since houses of the middle ages,  
where the ground in the lower story was covered by fields of  
of stones set on edge.

The further back one goes towards ancient times, the more one



great streets of the Gallo-Roman cities during the Carlovingian period retained well or badly the antique pavements, but the sewers were obstructed, the pavements were broken, and the those streets only formed unclean sewers. Yet already in the 12 th century were paved certain squares or frequentel streets.

We have sometimes discovered remains of these pavements, h habitually made of small cubes of sandstone or other resistant stone.<sup>1</sup> (Fig. 1).

Note 1.p.55. In the city of Paris; at Vezelay, Sens, Provins, Comcy-le-Chateau.

Philip August passes for having paved the streets of Paris with great blocks of sandstone.<sup>2</sup> William the Breton claims t that this pavement was made of very large square stones. There exists no trace of that pavement. When a few years since the foundations of the little Chatelet were uncovered to rebuild the bridge Petit-Pont, there were removed quite a large quantity of paving blocks of sandstone placed about 3.3 ft. below the existing surface. These blocks were about 1.3 ft. square and 0.7 ft. thick. Very much wear on their upper surfaces. They must have served for a very long time, and they probably dated from the epoch of the construction of the Chatelet (end of the 12 th century). During the 15 th and 16 th centuries were often employed boulders for paving the public streets, courts and squares. These boulders were tamped on a bed of sand, as still practised in some cities of the South of France, notably at Toulouse. At Paris, Rue de la Juiverie was repaved on this system as an experiment during the League.

When the incline was steep, the streets were paved with hard stones set on edge. We have found pavements of that kind in a good state of preservation around the castle of Pierrefonds.

Note 2.p.55. Willton of Nangis, Chronicon, 1184. Edit. by Society of History of France. Vol. I. p.78.

The lower stories of houses were often paved, and there were still seen a few years since houses of the middle ages, where the ground in the lower story was covered by little cubes of stone about 4 ins. on the side, set pointed on a bed of mortar or cement.

#### PEINTURE. Painting. Mural Painting.

The further back one goes toward ancient times, the more one





recognizes that there existed an intimate alliance between architecture and painting. All edifices of India, Asia Minor, Egypt and Greece, were covered by paintings inside and outside. The architecture of the Dorians, of Attica, Magna Grecia and Etruria, was painted. The Romans appear to have been the first, who erected under the empire monuments of white marble or stone without any coloring; as for their coatings of stucco, they were colored externally and internally. The barbaric peoples of northern and western Europe painted their houses and wooden temples, and the Scandinavians lavished brilliant colors and gilding in their habitations.

We must only consider here those facts well known to archaeologists, and only occupy ourselves with painting applied to the French architecture of the middle ages. Then as during the good period of antiquity, painting seems never to have been separated from architecture. These two arts mutually aided each other, and what we now call the picture did not exist, or at least it had only a very secondary importance. Gregory of Tours mentions on several occasions the paintings that decorated the religious edifices and palaces of his time. "And then (the soldiers besieging the city of Comminges) said to G. Gondovald), "art thou that painter, who in the time of king Clotaire daubed with lattices the walls and vaults of oratories?"<sup>1</sup> When that prelate repaired the basilicas of S. Perpetua at Tours, he caused them to be "painted and decorated by the workmen of the country with all the splendor that they had formerly."<sup>1</sup> That custom of painting edifices continued during the entire Carlovingian period, and Frodoard informs us that bishop Hincmar, rebuilding the cathedral of Rheims, "ornamented the vault by paintings, lighted the church by glazed windows, and caused it to be paved with marble."<sup>2</sup> Researches made in the architecture called Romanesque prove, that painting was considered the necessary finish for every civil and religious edifice, and then by preference was applied to ornamental sculpture or statuary, to mouldings and profiles, as if to emphasize the importance and value. However, when that architecture assumed an original character, when it dropped Gallo-Roman traditions, i.e., about the end of the 11th century, painting was applied to it by a special method, as if to better exhibit the proportions and forms. We do not know

very well, according to what principles relating to the  
revolutionary movement of the West, and to the fact that  
the only way to achieve success in Italy, for example,  
is to have a small, but very active, group of men in  
the position of some of the best; and in those terms the ef-  
fect of the colonies is to be seen by means of those millions of  
little groups of men or of half a dozen companies, is not always  
in accord with the revolutionary theory. Besides that, the  
colony gives to the walls of a village a special appearance,  
and sometimes better with people, not for a general re-  
form, but for the sake of the whole of the village, or the  
village, etc. The people called by the name of colonies are something  
different; one is organized and planned; the other is  
spontaneous. The first is the result of a conscious effort  
by the force and energy of the people and people for  
their own improvement, first of all in the sense of organization and  
composition of lines. It is certain that the people of a vil-  
lage, who are organized, are as necessary to revolution-  
ary work as the force of the people to have achieved the most  
important things in their movements. They have achieved only  
as a uniform, dull and tame coloring, leaving to the lines  
their purity, even according to them, and expressing the most  
vital aspects.

Note 1.9.54. Latin note. Greek. The. West. France. Book VII.  
Chap. 86.

Note 1.9.57. Latin note. Book X. Chap. 81. Greek. 19.

It is not possible to achieve success in Italy, for example,  
by the force of the people and people for their own improvement,  
first of all in the sense of organization and composition of lines.  
It is certain that the people of a village, who are organized,  
are as necessary to revolutionary work as the force of the people  
to have achieved the most important things in their movements.  
They have achieved only as a uniform, dull and tame coloring,  
leaving to the lines their purity, even according to them, and  
expressing the most vital aspects.



very well, according to what principle painting covered the carlovingian monuments of the West, and to guide us in our researches, we have only certain churches in Italy, for example like S. Vitale of Ravenna, some mosaics still existing in the basilicas of Rome or Venice; and in those remains the effect of the colorings obtained by means of those millions of little cubes of glass or of hard stone combined, is not always in accord with the architectural forms. Besides this mode of coloring gives to the walls of vaults a metallic appearance, that harmonizes neither with marble, nor for a stronger reason with the stone or the stucco of columns, piers, bands, plinths, etc. The mosaic called Byzantine always has something barbaric; one is surprised and preoccupied; those tones of extraordinary intensity, those singular reflections that modify the forms and destroy the lines cannot suit peoples for whom architecture, first of all is an art of proportions and combinations of lines. It is certain that the Greeks of antiquity, who still regarded coloring as necessary to architecture, were too much lovers of form to have admitted the mosaic termed Byzantine in their monuments. They knew painting only as a uniform, dull and fine coloring, leaving to the lines their purity, even accenting them, and expressing the most delicate details.

Note 1.p.56. Latin note. Græg. Tur. Hist. France. Book VII. Chap. 36.

Note 1.p.57. Latin note. Book X. Chap. 31. Sect. 19.

Note 2.p.57. Frodoard. Hist. de l'Eglise de Reims. Chap. 5.

Painting applied to architecture can only proceed in two ways; either it is subject to the lines, forms and design of the construction; or it takes no account of them and extends independently over the walls, vaults, piers and mouldings.

In the first case it forms an essential part of the architecture; in the second it becomes a furnishing decoration, if one can so express himself, that has its special laws, and often destroys the architectural effect to substitute for it an effect belonging only to the art of the painter. That the painters regard this last kind of decoration as the sole good, is nothing to surprise one; but that the art gains by it is a question that merits discussion. Painting was separated from architecture only at a very recent epoch, i.e., at the moment

of the Renaissance. Now the day has come, the day of  
of painting made in the studio of the master, was un-  
ed for painting, so that the wall must remain in, paint-  
ed architectural decoration has been lost. The architect and  
the painter have worked separately, rarely touching the same  
work together, and when by chance they have collaborated  
to remain on a common ground, it is found that they no longer  
understand each other, and that feeling no one in common,  
there no longer exists any bond that can unite them. The  
architect, the painter, the sculptor, the craftsman, the  
classes for him, and the architect believes himself right in  
believing that the painter takes no account of his profession  
and interests. The architect is the master, the painter  
is a slave, and one who has no voice in the matter. It is  
not days to recognize that. In a great part of these archi-  
tects the architect has not been able to see the other side  
should be painted by painting, and on the surface that  
be painted, and that the painter regards these surfaces only  
as a canvas reserved in a certain less convenient than his own,  
because calling little for what there may be around his canvas.  
Thus he cannot understand the decorative element during the  
middle ages, nor even during the Renaissance, and consequently  
in painting the value of the plastic element did not increase  
himself, he was indeed conscious of the plastic value as worked,  
of the effect of the surface that he desired to produce. It  
was painting a wall in a certain way, he does not follow  
that the work was a decorative painting, and nearly all  
architects painted in one time the same only painting,  
in spite of the difference in process; but he was not aware  
painters seek a line, that they are conscious in colors having  
such a very slight, a particular perspective, or that they ex-  
tend in perspective between two horizontal lines. Now thus a  
process the old masters of mosaic, but the western painters  
of the middle ages. As for the element of ornament, chance,  
instinct and imitation alone serve today as guides, and this  
lines out of them it would be difficult to say why a certain  
ornament takes such form rather than another, why it is red  
and not blue. The red what is called red, and it is believ-  
ed that this suffices for decoration by illustration the in-  
terior of a church; or indeed he collects everywhere fragments



of the Renaissance. From the day that the picture, the isolated painting made in the studio of the painter, was substituted for painting applied to the wall that must retain it, painted architectural decoration has been lost. The architect and the painter have worked separately, daily deepening the chasm that separates them, and when by chance they have endeavored to reunite on a common ground, it is found that they no longer understand each other, and that desiring to act in concert, there no longer exists any bond that can reunite them. The painter accuses the architect of not having arranged suitable places for him, and the architect believes himself right in declaring that the painter takes no account of his architectural arrangements. This separation of two arts, once sisters, is visible, when one casts his eyes on the attempts made in our days to harmonize them. It is clear that in these attempts the architect has not conceived or seen the effect that should be produced by painting applied on the surfaces that he prepares, and that the painter regards those surfaces only as a canvas stretched in a studio less convenient than his own, besides caring little for what there may be around his painting. Thus he cannot comprehend the decorative painting during the middle ages, nor even during the Renaissance, and Michelangelo in painting the vault of the Sistine Chapel did not isolate himself, he was indeed conscious of the place where he worked, of the effect of the entirety that he desired to produce. If one paints on a wall instead of on a canvas, it does not follow that the work may have a monumental painting, and nearly all mural paintings produced in our time are always only paintings, in spite of the difference in procedure; thus we see that these paintings seek a frame, that they are grouped in scenes having each a view point, a particular perspective, or that they extend in processions between two horizontal lines. Not thus proceeded the old masters of mosaic, nor the western painters of the middle ages. As for the painting of ornament, chance, instinct and imitation alone serve today as guides, and nine times out of ten it would be difficult to say why a certain ornament takes that form rather than another, why it is red and not blue. One has what is called taste, and it is believed that this suffices for decorating by illuminations the interior of a church; or indeed he collects everywhere fragments





of paintings and applies them indifferently, this that was on a column goes on a plane surface, the other that was seen on a tympanum is on a plinth. The public is shocked by this medley, and finds that with a good effect, but it is demonstrated to them, that the decorators of the middle ages have been scrupulously consulted, and the same public concludes from this that the decorators of the middle ages were barbarians, which is further very willingly agreed to.

In the decoration of architecture it is true, that it is necessary to admit, that the painting is perhaps the most difficult part, and what demands the most reflection and experience. When one painted the interiors of all edifices, the richest as well as the poorest, he necessarily had data and rules that he followed by tradition; the most ordinary artists then could not go astray, but today those traditions are absolutely lost, everyone seeks an unknown law; thus one should not be astonished if most of the attempts made have only produced unsatisfactory results.

The 12 th century attained the climax of the art of architectural painting during the middle ages in France; stained glass, vignettes of manuscripts and the fragments of mural paintings of that epoch emphasize a learned and very advanced art, a singular alliance of harmony of tones, the coincidence of this harmony with the forms of the architecture. It is not doubtful that this art was developed in the cloisters and proceeded from Grecian-Byzantine art. Then the most beautiful fabrics, furniture, colored utensils, even a great number of manuscripts, brought from the Orient were contained in the treasuries and libraries of monasteries, and served as models for the monks devoted to art works. Later, about the end of the 12 th century, when architecture left the monasteries and was practised by the lay school, occurred a revolution in the art of painting, which without being as radical as that made in architecture, however profoundly modified the principles established by the monastic school.

Without speaking at greater length of some scarcely visible fragments of painting, of formless traces that appeared on certain monuments before the 11 th century, we shall only state that from the Gallo-Roman epoch, i.e., about the 4 th century, all the monuments appear to have been painted inside a

not definite. That painting was applied either on the stone itself, or on the plaster covering the masonry walls, and for colors elevated above the ground is only consisted of a sort of whitewash yellowish ash, on which are traced very fine lines in black or red color. Near the ground appeared suspended bones, redish brown or even black, relieved by a yellow, resembling in color bones. The painting was done on a red ground and often enclosed by black lines and yellow borders. This sort of painted decoration appears to have long been practised among the Greeks, and to the moment when Christianity invited artists from Italy and the East, there came foreign influence never was not the only one, and that led to the art of monumental painting, such as we see developed in the 12th century. The Greeks and Romans were with painted ornaments their houses, temples, and ships; there exist in the library of the library of the British Museum a number of ancient vases of Greek manufacture of the 1st century, which in drawing, delivery of execution and general harmony of tones, are of surpassing beauty. That art is probably come from Persia, from that source common to all peoples that have known how to harmonize colors. The facility with which the Persians, when scarcely established on the soil of Asia, exercised and even developed the art of architecture, the already refined taste of living to which the Persians had arrived at the moment of the invasion of William the Great, sufficient to have been the instincts of all sorts, and that they were from Persia that had long possessed certain ideas of art. The first it is necessary to understand well what is the art of painting applied to architecture. In our time we come again to the question in all these questions of art, and it is well that to state the principles. That is understood by a people of colorists (to use a sanctioned expression, however bad it may be), the Venetians, the Flemings for example, the Chinese, Japanese, Persians, and even the Arabians of antiquity. To obtain a certain effect in a painting of certain tones given by nature, by a very delicate accord of half tints, as could be done either by Titian, Rembrandt



and outside. That painting was applied either on the stone itself, or on the plastering covering the masonry walls, and for parts elevated above the ground it only consisted of a sort of whitewash or yellowish wash, on which were traced very fine lines in black or red ochre. Near the ground appeared sustained tones, reddish brown or even black, relieved by some yellow, greenish or white bands. The sculptures themselves were covered by this thin wash, the ornaments being detached on red grounds and often enhanced by black lines and yellow touches.<sup>1</sup> This sort of painted decoration appears to have long been practised among the Greeks, and up to the moment when Charlemagne invited artists from Italy and the East, That last foreign influence however was not the only one, which must lead to the art of monumental painting, such as we see it developed in the 12 th century. The Saxons and Normans covered with painted ornaments their houses, utensils, arms and ships; there exists in the library of ~~the library of~~ the British museum vignettes of Saxon manuscripts of the 11 th century, that in drawing, delicacy of execution and general harmony of tones, are of surprising beauty.<sup>1</sup> That art evidently came from northern India, from that source common to all peoples that have known how to harmonize colors. The facility with which the Normans, when scarcely established on the soil of Gaul, exercised and even developed the art of architecture, the already refined mode of living to which the Saxons had arrived at the moment of the invasion of William the Bastard, sufficiently indicates that these peoples had in themselves something else than the instincts of pillagers, and that they came from families that had long possessed certain ideas of art. But first it is necessary to understand well what is the art of painting applied to architecture. In our time has come such great confusion in all these questions of art, that it is well first to state the principles. What is understood by a people of colorists (to use a sanctioned expression, however bad it may be), i.e., the Venetians, the Flemings for example, the Hindoos, Chinese, Japanese, Persians, and even the Egyptians of antiquity. To obtain a charming effect in a painting by means of sacrifices skilfully made, by an exaggeration of certain tones given by nature, by a very delicate accord of half tints, as could be done either by Titian, Rembrandt

of operation of the mind. There is only one thing, the form-  
of the mind, and all the weavers of India came to  
make whole hearts, which without one exception live harmoni-  
ous combinations of colors. But one thing on the human mind  
may develop requires a social atmosphere extremely civilized  
in all points; the most perfect Tibetan, living in a  
wooden hut, in the midst of a family as miserable as himself,  
will weave a small square of colors will carry  
our eyes, and can be as perfectly imitated by our best fi-  
neest manufacturers. The more or less perfect condition of  
a people, from our point of view, there is no possible to the  
development of a certain part of the art of painting. It is  
not to be denied that the art of painting is not complete from  
this, that when a people is very civilized, it cannot remain  
or return to a barbarous art; witness the works in Japan, a  
very civilized people, who in fact produced excellent models  
in painting and in architecture; and while the art of the  
painter, as we understand it, is to be seen, has survived  
at a very high degree of perfection, at the same time one can  
not have an architectural painting; witness the Venetians of  
the 15th and 16th centuries. A similar conclusion is to be  
drawn from the preceding observations, and is that the art  
of the painter of pictures and the art of the painter applied  
to architecture proceed very differently, that to define so  
common these two arts is to attempt the impossible. Some of  
the art is to achieve this impossibility. That is a disas-  
ter. It is a scene that one cannot see through  
a frame, an open window. Only of point of sight, only of a  
direction of the light and only of effect. To properly view  
a picture, there is but one single point, looked on the per-  
pendicular spread at the point on the horizon, that is called  
the point of sight. For every delicate eye, to view a picture  
outside that single condition is a pain, as it is torture to  
find one's self before a picture without a sense of relief  
the horizon line. Many persons suffer from this without misun-  
derstanding it as such; but it is not on the consciousness of the as-  
pect of the picture itself, but we can understand the rules  
of the art.

Note 1. p. 26. We have seen many traces of this sort of point-



or Metzu, and make a Tibetan shawl, these are two very distinct operations of the mind. There is only one Titian, one Rembrandt and one Metzu, and all the weavers of India came to make woollen scarfs, which without one exception give harmonious combinations of colors. That one Titian or one Rembrandt may develop requires a social atmosphere extremely civilized in all points; but the most ignorant Tibetan, living in a wooden hut, in the midst of a family as miserable as himself, will weave a shawl whose rich assemblage of colors will charm our eyes, and can be but imperfectly imitated by our best directed manufactories. The more or less barbarous condition of a people, from our point of view, then is no obstacle to the development of a certain part of the art of painting applicable to monumental decoration; yet one should not conclude from this, that when a people is very civilized, it cannot attain or return to monumental art; witness the Moors in Spain, a very civilized people, who in fact produced excellent models in painting applied to architecture; and while the art of the painter, as understood since the 16<sup>th</sup> century, has arrived at a very high degree of perfection, at the same time one cannot have an architectural painting; witness the Venetians of the 15<sup>th</sup> and 16<sup>th</sup> centuries. A single conclusion is to be deduced from the preceding observations; this is that the art of the painter of pictures and the art of the painter applied to architecture proceed very differently, that to desire to combine these two arts is to attempt the impossible. Some lines suffice to emphasize this impossibility. What is a picture? It is a scene that one causes the spectator to see through a frame, an open window. Unity of point of sight, unity of direction of the light and unity of effect. To properly view a picture, there is but one single point, located on the perpendicular erected at the point on the horizon, that is called the point of sight. For every delicate eye, to view a picture outside that single condition is a pain, as it is torture to find one's self before a theatre decoration above or below the horizon line. Many persons suffer torment without mistrusting it we admit; but it is not on the coarseness of the senses of the greatest number, that we can establish the rules of the art.

Note 1.p.59. We have seen many traces of this sort of pain-





paintings on fragments of Gallo-Roman monuments of the late time; unfortunately these traces rapidly disappear on contact with the air.

Note 1.p.60. Among others see the manuscripts of the Liby. Cott. Nero. Evang. lat. Sax.

Then starting from this rigorous condition imposed on the picture, we do not understand a picture, i.e., a scene represented according to the rules of perspective, light and effect, so placed that the spectator finds himself 13.1 or 16.4 ft. below its horizon, and very far to the right or left from the point of sight. The brilliant epochs of the art never admitted such enormities; or indeed the painters (as during the middle ages) have not taken into account in the subjects painted at all heights on the walls, either of a horizon, of a real place, of perspective effect or of a single light; or indeed those painters (like those of the 16<sup>th</sup> and 17<sup>th</sup> centuries) have resolutely attacked the difficulty by tracing the scenes, that they desired to represent on the walls or under the ceiling of a hall, according to a single perspective, assuming that all the personages or objects shown to the spectator were actually placed where represented, and consequently presenting themselves in an aspect determined by that place itself. Thus one sees in the ceilings of that epoch personages by the soles of their feet, certain figures whose knees conceal their chests. Naturally that fashion of deceiving the eye had a great success. Yet it is clear that if in that manner of monumental decoration, the horizon is assumed to be placed 6.6 ft. above the ground, at the real height of the eye of the spectator, there can only be a single point of sight on all that horizontal surface assumed at 6.6 ft. from the pavement. Now from the moment that one leaves that single point, the perspective drawing of all that decoration becomes false, all the lines appear to dance, and make seasick the persons that have the habit of wishing to take account of what their eyes cause them to perceive. When the art has fallen into these errors, to desire to leave the domain assigned to it, it soon ceases to exist; it is the dangerous leap that replaces elegance, the juggler that takes the place of the orator. But still the artists that have adopted this kind of decorative painting have been able to adopt one point, a single one we say, from





which the spectator can experience complete satisfaction, as they believe; it would be little for the entire surface of a hall to give a single point, from which one could perfectly seize the decoration, but finally it would be something. The scenes represented further find themselves framed in the midst of an ornamentation that itself affects the reality of the reliefs, shadows and lights playing on the projecting bodies. This was an ornamental system possessing its unity and its reasons, while one cannot find the reason for this system of painting, for example, which beside scenes representing the reality of effects, shadows and lights, and perspective, places flat ornaments composed of contiguous tones. Then the scenes that represent the actual effect produced by the relief of the differences of planes are in complete dissonance with that flat ornamentation. It was not without reason that the painters of the middle ages saw in painting, either that it represented scenes, or that it was only composed of ornaments, a surface that must always appear plane and solid, that was not intended to produce an illusion, but a harmony. We admit that some prefer the deceptive painting of the vault of the great Jesuit church at Rome to that of the vault of S. Savin near Boitiers; but what we cannot admit, is that some pretend to harmonize these two opposed principles. It is necessary to declare for one of the two.

If painting and architecture are united in an intimate alliance of art during the middle ages, by a stronger reason the painting of figures and ornaments formed only a single ornamental covering. The same mind conceived the composition of the scene and that of the ornamentation, the same hand drew and colored both, and the monumental paintings could not have the appearance of pictures surrounded by wall-paper, as too frequently occurs today, when one makes what he desires to call mural paintings, that are indeed only paintings pasted on the wall, enclosed by a frame, that instead of isolating them as would the ordinary frame of gilded wood, injures and extinguishes them, reduces them to the state of a dark or light spot, deranges the effect, takes the eyes too much and wearies the spectator. When the painting of scenes on the walls of an edifice is not treated like the ornamentation itself, it is naturally killed by that; it is necessary either that it





the ornamentation be treated to deceive the eye, if the subject enters the domains of reality, or that the subject be treated as an illuminated drawing, if the ornamentation is flat.

These principles established, we shall first occupy ourselves with the monumental painting of subjects. We have stated that Greek art was the first school of our western painters from the point of view of iconography and that of execution. Yet from the 11 th century in France (and these remain to us in monumental paintings of subjects preceding that epoch) one recognizes in the manner of treating the drawing an independence, a truth of expression in pose, that one does not perceive in the so-called Byzantine paintings of the same epoch. To recover that independence in Greek painting, it will be necessary to examine the Byzantine manuscripts of the 8 th and 9 th centuries;<sup>1</sup> later that Grecian art became fixed and fell into a narrow routine that it never left. Not only our artists of the 11 th century took their models in the paintings of Grecian style, but they even took possession of the material processes adopted by the Byzantines; we find the evident proof of this in the treatise of the monk Theophilus, who lived in the 12 th century. The outlines of the paintings of S. Savin<sup>2</sup> were made with the brush; they consist of reddish brown lines. "The colors were applied in broad flat washes without indicating the shadows, to the point that it is impossible to determine from what side the light comes. Yet in general the projections are indicated in light and the contours are accented by darker tints; but it seems that the artist had in view only to obtain a sort of conventional modeling, nearly what is seen in our arabesque painting. In the draperies, all folds are marked by dark lines (brownish red), whatever the color of the material. the projections are accented by other white lines quite badly blended with the general tint" (Those lines are not blended, but indicated by hatchings more or less wide painted on the tone of the fabric). "There are cast shadows nowhere, and as for aerial perspective, or even linear perspective, it is evident that the artists of S. Savin did not trouble themselves about it."<sup>3</sup>

Note 1.p.63. The Imperial Library possesses some of these of rare beauty.

Note 2.p.63. These paintings in great part date from the

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second half of the 11 th century.

Note 3.p.63. See Notice sur des peintures de l'église de S. Savin. -- M. Merimee, from whom we borrow this passage, adds a little later these observations, that we must mention. "Almost always the figures are detached on a light and prominent color, but it is difficult to divine what the painter desired to represent. Often a series of parallel lines of different tints presents the appearance of tapestry; but that I think, is only a species of capricious ornamentation, without any pretense of truth, and the sole aim of the artist seems to have been to emphasize the personages and accessories essential to his subject. In truth, these accessories are only a sort of hieroglyphics or purely conventional images. Thus the clouds, trees, rocks and buildings do not give the least idea of imitation; they are rather in a way, graphical explanations added to groups of figures for understanding the compositions.

Surfeited today by the search for truth in little details, that modern art has carried so far, we have difficulty in understanding that artists formerly have found a public, that accepted such rude conventions. Yet nothing is easier to produce than illusion, even with naive means, that seems so far from it. Assuredly a stage wall of marble with its immovable decoration, did not prevent the Greeks from being interested in an act, that must occur in a forest or among the rocks of the Caucasus; and the audience of Shakespeare seeing two lances crossed at the back of the barn that served as a theatre, understood that a battle occurred; the incident was agitating, and everyone trembled at the cries of Richard offering his kingdom for a horse.

Beside that indifference to accessory details, or if you prefer, that primitive ignorance, one sometimes notes a very correct imitation of a feeling of very acute observation in the attitudes and poses of the personages. The heads, although without expression, are often distinguished by a singular nobility and a regularity of features, that recalls, it is true very rudely, the types that we admire in antique art."

In fact, in the painting of subjects, each figure presents an outline vigorously detached on a light ground, or in light color on a dark ground, only enriched by lines that indicate the forms, folds of drapery and the internal lines. The model-





modeling is obtained only by those more or less accented lines, all in the same brown tone, and the color is nothing but an illumination. The paintings on the so-called Etruscan vases, those discovered in the tombs of Corneto, proceed absolutely in the same manner. There the accessories are treated like hieroglyphs, the human figure alone being developed according to its real form. A palace is rendered by two columns and a pediment, a tree by a branch surmounted by some leaves, a river by a winding line, etc. When monumental painting is concerned, can one produce on the spectator as much effect by these primitive means as by the use of deceptions? Or to speak more correctly, when men are born in the midst of a civilization where one is accustomed to estimate painting according to the greater or lesser reality obtained, can they be affected before objects treated as are those of the tombs of Corneto, those of the catacombs, or those of the church of S. Savin? That is the entire question, only a question of education.

A child is quite as much charmed, if not more so, before an illuminated drawing as before a painting by Rubens. It is not stated that this drawing is barbaric and without value as art. On the contrary, let this drawing be reproduced in beautiful forms, be pure in style and the illumination be harmonious; if the spectator is moved before that interpretation of nature, is not that a homage rendered to art? And does not art thus prove that it is a power? If for an easel painting one gradually attains a fine and complete imitation of the subject chosen, producing light effects of extreme delicacy, concentrating so to speak the attention of the spectator on a scene rendered by the aid of scrupulous observation with perfect distinctness, certainly we do not complain, since that advance we owe <sup>to</sup> the masterpieces that fill our galleries, and which are one of the glories of western civilization since the 16th century. But the art suitable for the framed canvas, the picture, whatever its dimensions, has no relation to that destined to cover the walls and vaults of a hall. In the picture we see only an isolated expansion of a single art, and we isolate ourselves to observe it; it is again a window that we open on a scene suited to charm and move us. Is it the same in a hall that is covered by paintings? Is not there a mixture of several arts? Should these proceed in isolation or produce an effect





of entirety? The reply cannot be doubtful.

If we examine the attempts that have been made to harmonize the two opposed principles of painting taken as isolated and of painting purely monumental, do we not perceive at once the rock on which the greatest talents have struck? And the vault of the Sistine Chapel itself, in spite of the prodigious genius of the artist that conceived and executed it, is it not an episode that shocks rather than charms? Yet Michelangelo, architect and painter, as much as the programme imposed on him allowed him, knew so well how to combine his subjects and his figures with the ornamentation, for the place occupied, that the unity of the vault is complete. But what becomes of the hall? From the decorative point of view, what becomes of the painting of the last judgment under the crushing conception?

In the Sistine Chapel, one must isolate himself to observe the vault, likewise to see the last judgment, and forget the hall. One remembers the vault, but recollects very imperfectly the judgment, unless he knows it from engravings; as for the hall, he does not know that it exists. Now the arts are not made to destroy each other, but to aid and enhance each other; at least they were so understood in the best epochs. Much is pardoned to a genius like Michelangelo for suppressing what surrounds him and for injuring himself at need, effacing some of his own works to make a single one resplendent; that caprice of a giant is only ridiculous in men of ordinary capacity; yet it has turned the heads of all painters since the 16th century, it is so true that the example of even men of genius is baneful, when they abandon true principles, and that one should never allow himself to be guided other than by principles. From Michelangelo to Carracci is but a step, and who are the successors of Carracci?

Artistic peoples have seen in monumental painting only an illumined drawing very slightly modeled. If the design be beautiful, the illumination harmonious, monumental painting says all that can be said; the difficulty is certainly very great and the result obtained is considerable, for only by the aid of those means apparently so simple, that one can produce those grand effects of colored decoration, whose impression remains deeply graven in the mind.

We have stated that the Greek painters were the first mast-

masters of our western artists: one in France (we speak of a  
Flemish master) painting a picture from a  
as it really lived itself alone in. Already in the 18th cen-  
tury, William Turner, whose in his paintings  
divine dimension,<sup>1</sup> in showing this aspect of nature - (see  
last page).

Note 1. p. 66. Book I. Chapter 2.  
That nature rendered to the artist that should be left to  
himself makes a second contrast to the error of the artist  
in the 18th century, when the artist was not  
our days.<sup>2</sup> In spite as well as in the work of the processes  
of the painting process in France during the 18th and 19th  
centuries, the recognition of the instructions of the  
18th, the Greek school of the 18th as in nature. We again in  
find the traces of this Greek school of the 18th century in  
the works of the Greek school (18th century), and a  
even again in the work of the Italian school (18th century).  
and lived in the 18th century;<sup>4</sup> but in the works of the 18th  
the artist rendered the processes further on by the 18th  
the school, which is naturally based on the 18th  
the 18th century, and so on, and so on, and so on, and so on,  
in the 18th century of nature. However (and that is to be said),  
in the 18th century of nature, the artist works a continuous  
less technical, the artist's work is more and more  
know how to leave to their paintings a decorative harmony and  
all the artists of the 18th century, maintaining the principle  
is of a more technical and finally modeled. The artists in  
nature, in the 18th century, the correct observation  
of the pose, the expression, and even expression, the artist  
before the Italian master; the relaxation and virtues remain  
and as we know the 18th century are the proof of this, and  
fifty years before the artist was possessed in France painting,  
and the artist's work in the 18th century was a continuous  
the end of the 18th century.<sup>1</sup> From the end of the 18th to the 19th  
centuries the drawing was modified. At first the 18th century  
the artist, in the 18th century, the artist's work was a continuous  
nature, and so on, and so on, and so on, and so on, and so on,  
nature, yet without losing the style, the style and pose  
soon appeared the 18th century, and then came the 19th century  
is called expression. The modeling without assisting effect



masters of our western artists; but in Greece (we speak of B Byzantine Greece) painting retained a hieratic form from which it rapidly freed itself among us. Already in the 13 th century, Willian Durand, bishop of Mende, wrote in his *Rationale divinum officiorum*,<sup>1</sup> in quoting this passage of Horace:- (see Latin text).

Note 1.p.86. Book I. Chapter 3.

That homage rendered to the freedom that should be left to the artist makes a strong contrast to the rigor of the traditions of the Byzantine school, preserved almost intact until our days.<sup>2</sup> In style as well as in the work of the processes of the paintings produced in France during the 11 th and 12 th centuries, one recognizes exactly the instructions of Denis, the Greek author of the *Guide de la Peinture*. We again find the recipes of this Greek master of the 11 th century in the treatise of the monk Theophilus<sup>3</sup> (12 th century), and even again in the work of the Italian painter Cennino Cennini, who lived in the 14 th century;<sup>4</sup> but if the artists of the middle ages long retained the processes furnished by the Byzantine school, they very promptly freed themselves from the hieratic traditions, we may say, and sought their inspiration in the observation of nature. However (and that is to be noted), in giving to the style of their works a character gradually less traditional, our western artists and especially in France, knew how to leave to their paintings a decorative harmony until the middle of the 15 th century, maintaining the principle of a design illuminated and lightly modeled. Our artists in France, in what concerns the drawing, the correct observation of the pose, composition and even expression, freed themselves before the Italian masters; the paintings and vignettes remaining to us from the 13 th century are the proof of this, and fifty years before Giotto we possessed in France paintings, which had already made in the art the advance attributed to the pupil of Cimabue.<sup>1</sup> From the end of the 12 th to the 15 th centuries the drawing was modified. At first bound to Byzantine traditions, it soon rejected these conventional school methods, and sought principles derived from an observation of nature, yet without abandoning the style, the study and pose soon attained rare delicacy, and then came the search for what is called expression. The modeling without attaining effect





applied to marking the planes. One recognizes remarkable effects of composition in the second half of the 13 th century. The dramatic idea is adopted, and the scenes sometimes assume a movement of powerful energy. About the middle of the 14 th century, from fine and delicate, the drawing already tends toward mannerism; the accepted types are lost to be replaced by the imitation of individual nature; the exaggeration of this mode is sensible at the beginning of the 15 th century, to the point that the ugly is introduced into the art of painting, and too soon possesses itself of the entire form. At the same time one recognizes that the skill of the hand is extreme, that the artists possess excellent procedures, and that they push to excess the search for detail, minuteness in execution, in the study of the accessories.

Note 2.p.66. On this subject see *Manuel d'iconographie chrétienne*, translated from the Byzantine manuscript, *Guide de la Peinture*, by Dr. Paul Durand, with an introduction and notes by M. Didron. Denis, author of the *Guide*, lived in the 11 th century.

"The following canon," says M. Didron in one of his notes (Introduction, p.3), "of the second council of Nicea, compared to the passage of the bishop of Nende, marvellously expresses the condition of dependence in which the Greek artists lived. (Latin canon). In fact the council of Nicea did not do entirely wrong, and the most beautiful Byzantine paintings known are certainly the oldest.

Note 3.p.66. *Diversarum artium schedula*, published by count d'Escalopier. 1843.

Note 4.p.66. See edition of this work published at Rome in 1821 by chevalier Giuseppe Tambroni.

Note 1.p.67. There is wanting for our artists a Vasari, an exclusive apologist. This is a misfortune, but does that diminish their merit? Is it for us to reproach them with the oblivion in which we have left them?

The coloration suffers transformations less rapid; the harmony of monumental painting is always subject to a principle essentially decorative; this harmony changes the tonality, it is true, but it is always a harmony applicable to subjects as to ornaments. Thus in the 12 th century, for example, this harmony is absolutely that of Greek paintings, all very light for





the grounds. For figures as for ornaments the local tone, which is the color that replaces what we call half tint; parts light and almost white on all projections; modeling brown, a uniform for all shades; delicate line either in light on the large dark parts or in brown on the large light portions, so as to avoid spots in the entirety. Colors broken and never absolute,<sup>2</sup> at least on the large parts; sometimes the use of black to enhance. Gold adopted as embroidery, brilliant parts, halos; never or very rarely as the ground. Dominant colors are yellow ochre, light brownish red, green of various tones; secondary colors rose purple, light violet purple, light blue. Always with a brown line between each juxtaposed color. Further, it is rare in the harmony of the paintings of the 12th century, that one finds two colors of equal value placed beside each other without having between them a color of inferior value. Thus for example, between brownish red and a green of equal value, there will be a yellow or a very light blue; between a blue and a green of equal value will be a light rose purple. General appearance soft and without shock, light and with very vivid firmness obtained by the brown line or the white touches. Full colors dominate, particularly blue and red. Green only serves as a means of transition, the grounds become dark, brownish red, deep blue, even sometimes black, gold, but in this case always netted. White only appears as lines or delicate touches; yellow ochre is only employed for accessories; the modeling is based on, and partakes of the local color. The tones are always separated by a very dark brown or even black line. Gold already appeared in mass on the vestments, but it is either netted or accompanied by brown touches. The flesh is light. General appearance warm and brilliant, uniformly sustained, even dark, unless revived by gold. About the end of the 13th century the tonality becomes harder; black often appears, very intense blue or brownish red, retouched with black; on the other hand, the vestments assume light colors, rose, light green, yellowish rose, very light blue; the use of gold is less frequent; white, and especially grayish white, greenish white, covers the draperies. These are sometimes polychrome, for example white, with transverse red bands embroidered with white, black or gold. The flesh is nearly always white in the 14th century, gray tones, grayish





green, light rose, dominate; the blue is always modified; if it appears pure, this is only in the ground and it is kept light. Gold is rare; the black, brownish red or yellow ochre grounds persist; the brown drawing is strongly accented, and the modeling is very light. White touches no longer exist, but black or brown touches are frequent; the flesh is very light. The general appearance is cold. The drawing infringes on the coloration, and it seems that the painter feared to lessen the value by the opposition of brilliant tones. About the second half of the 14 th century, the grounds are charged with varied colors like a mosaic, or present damascenings of tone on tone. The draperies and the flesh remain light; black disappears in the grounds, it only serves to outline the forms; gold combines with the mosaic of the grounds; the accessories are light, in grisaille enhanced by light tones or gold ornaments. The general appearance is soft and brilliant; the colors are much divided, while at the beginning of the 15 th century they appear in patches, warm and intense. Then the modeling is carried very far, although the single direction of the light may not be clearly determined. The projecting parts are the lightest, and this results from the procedure employed in decorative painting. But in the grounds, the accessories, trees, palaces, buildings, etc., are already treated in a more real manner; linear perspective is sometimes sought, but as for an aerial perspective, it was still not considered. Fabrics are rendered with skill, the flesh is very delicately modeled; gold mingles a little everywhere, on ornaments, on the hair, on the details and accessories, and one does not see those sacrifices justly regarded as necessary in the painting of pictures. The most insignificant accessory is painted with as much care, and is as much in the light as the principal personage. There is one of the conditions of monumental painting. On the walls of a hall viewed obliquely, what the eye demands as a general sustained harmony, a surface uniformly solid and rich, not pierced or with planes concealed by sacrificed tones, that derange the proportions of the system of the architecture. These general principles being established, we pass to the study of the styles of the painting of subjects and to that of the processes employed.

Note 2.p.67. That arises from the procedure employed, as we shall indicate immediately.

It has been said that the most striking feature of the painting is the use of color, particularly in the figures of the two women. The colors are not only bright and clear, but they are also used in a way that is very effective in drawing the eye to the figures. The use of color is one of the most important features of the painting, and it is one that has been much discussed by art critics. The colors are not only bright and clear, but they are also used in a way that is very effective in drawing the eye to the figures. The use of color is one of the most important features of the painting, and it is one that has been much discussed by art critics.

Note 1. p. 66. Department of Ingres et Lorraine.  
Note 2. p. 66. See the copies of those paintings made with a  
reproduction given by H. Goussier (Paris) in the *Revue des Beaux-Arts*.

In the painting of the canal of Lorraine, it has been said that the use of color is one of the most important features of the painting, and it is one that has been much discussed by art critics. The colors are not only bright and clear, but they are also used in a way that is very effective in drawing the eye to the figures. The use of color is one of the most important features of the painting, and it is one that has been much discussed by art critics.



We have stated above that the most ancient paintings that we possessed in France, presenting a tolerably complete entirety, are those of the church of S. Savin near Poitiers. In these paintings, as we have again stated, although one again finds the traditions of the Byzantine school, yet he observes a certain freedom of composition, a true study of pose, a dramatic tendency, that no longer exists in the Greek painting of the 11 th century, then bound to invariable types. In the frescos of S. Savin beside a personage evidently represented according to a hieratic tradition, the artist has given to groups of figures attitudes studied from nature. Some scenes even have a dramatic movement very vigorously rendered, in spite of the imperfections and crudeness of the drawing. Among others, we shall cite the scenes from the Apocalypse painted beneath the porch; in the church beneath the vault, the offerings of Cain and Abel, the flight into Egypt, the construction of the tower of Babel, the drunkenness of Noah, the burial of Abraham (Fig. 1); Joseph sold by his brothers; Joseph accused by the wife of Potiphar. In these compositions is noted a grandeur, a true and strong feeling, even boldness, that sufficiently show that this school of Poitou did not restrict itself to the dry reproduction of Byzantine paintings. But later, in the 12 th century, we find French paintings scrupulously submitting to Greek traditions; such are those of the chapel of Liget,<sup>1</sup> whose drawing, types, compositions and modeling approach exactly to the school of Byzantium,<sup>2</sup> to the degree that one could attribute them to an artist of that school.

Note 1.p.69. Department of Indre-et-Loire.

Note 2.p.69. See the copies of those paintings made with a scrupulous care by M. Souvignet Petit (Archives des monuments historiques).

In the paintings of the chapel of Liget, if the art be subject to a sort of archaism, one feels a seeking for the beautiful, and perceives the last rays of antiquity, still so p brilliant in the catacombs of Christian Rome. Fig. 2 gives one of the personages painted on the walls of the chapel of Liget, and suffices to emphasize the relations existing between that art of the 12 th century and that of the primitive epochs of Byzantine painting. The tones of these paintings are soft, t the drawing is broad and firm. The colors are; light yellow f

for the channels with brown ornaments; green for the coal and  
set down, white for the roof; light brown for the man-  
... and a brown line.

... in the end of the 12th century, in the art of car-  
... in the 13th century, there was then a diversity  
of schools and experiments; some an entire devotion to the  
... of nature, study of form, action for dramatic effect. For ex-  
... in the 13th century, there was then a diversity  
of schools and experiments; some an entire devotion to the  
... of nature, study of form, action for dramatic effect. For ex-

... (at the end of the 12th century) the attention of  
the people of the town of ... seemed to concentrate  
themselves on the development of the new architecture. Then  
... the subject seemed to the artist to devote them-  
... to the execution of traditional patterns of glass. Further,

the newly introduced ornaments no longer offered to the  
... these great glass surfaces suitable for painting. Po-  
... was limited to the coloring of sculptures and to the  
... of ornament. But in  
the course of time, the painters had accustomed to  
... their talent, and did not remain station-  
... Then the level of architecture had been possession of

the people of the town had called a little, the prin-  
... of sculpture was seen to disappear on the lateral walls  
... and one could recognize the same advance  
... it had made in the successive observation of nature, in  
the action for the beautiful and in execution. It is indeed  
... that it had lost when there  
... as a result of the view of the grand style, as a result of the inter-  
... it already tended toward mannerism and exaggeration  
of expression; the glass was always true, the drawing was real-  
... but sculpture gave place to the action for a certain side-

... in places 34, 35, 36 and 37, give us certain examples



for the chasuble with brown ornaments; green for the cowl turned down, white for the robe; light brownish red for the maniple and the halo; as well as for the ground. The drawing is sustained and with a brown line.

During the period of the middle ages comprised between the 10 th and the end of the 12 th centuries, in the art of painting more than in architecture in France was then a diversity of schools and experiments; here an entire submission to the Byzantine masters, there attempts at emancipation, observation of nature, study of pose, search for dramatic effect. For example in Auvergne in the 12 th century existed a powerful school of painting, restricted in execution, beautiful in style, so far as the fragments, now rare, permit us to appreciate it. But then (at the end of the 12 th century) the attention of the peoples of the North of the Loire seemed to concentrate themselves on the development of the new architecture. Then abandoned the subjects painted on the walls to devote themselves to the execution of translucent painting of glass. Further, the newly inaugurated architecture no longer offered to the artists those great plane surfaces suitable for painting. Painting was limited to the coloring of sculpture and to the decorations obtained by the combination of ornaments. But in the cartoons of their glass, the painters had opportunity to largely develop their talent, and art did not remain stationary. When the fever of architecture that took possession of the peoples of the royal domain had calmed a little, the painting of subjects was seen to reappear on the internal surfaces of edifices; and one could recognize the immense advance that it had made in the attentive observation of nature, in the search for the beautiful and in execution. It is indeed necessary however to recognize, that it had lost much from the point of view of the grand style, as antiquity had understood it; it already tended toward mannerism and exaggeration of expression; the pose was always true, the drawing was refined, but grandeur gave place to the search for a certain already coquettish grace.

Villard of Honnecourt, who lived then (from 1250 to 1270), has left us precious statements on the methods of painters of his time.<sup>1</sup> The vignettes of this manuscript reproduced in facsimile in Plates 34, 35, 36 and 37, give us certain practical





procedures for obtaining the attitudes and poses of figures by means of combinations of straight lines or arcs of circles and geometrical figures; we shall limit ourselves to presenting here a single one of the examples given, so as better to show the methods on which Villard relied.

Note 1.p.72. See Album of Villard of Honnecourt, manuscript published in fac-simile with notes by Lassus and commentaries by A. Dorcel. Delion. Paris. 1858.

Here (Fig. 3) are two wrestlers, that the draftsman seems to have desired to show as having equal strength.<sup>2</sup> The procedure of drawing is this. (Fig. 4). Take the equilateral triangle A B C, whose base A B is divided into two equal parts, and gives two other secondary equilateral triangles. The axial line D C being extended, on this extension at E we take a point as centre of the circular arcs F G, H I. Having marked two points O, O, on the arc F G, these points are the centres of the arcs K L. Thus the sides of the great equilateral triangle and the sides of the two little triangles give us the direction of the legs of the wrestlers; the two arcs F G, H I, give the movement of the knees and trunks; the arcs K L the lines of the backs of the two figures. From which results the stability of the persons and the relations of their attitudes. Villard was not a painter but an architect, and gives only a certain number of figures obtained by means of geometrical traces and principally by triangles; but it suffices<sup>us</sup> to know thus the practical methods employed by draftsmen of figures; methods that compelled the most mediocre artists to confine themselves to the observation of certain very simple laws of easy application, by the aid of which then remained at least withing proper limits, even if they had not sufficiently elevated merit to produce masterpieces.

Note 2.p.72. This figure is copied in fac-simile.

In the French paintings of the 13 th century that remain to us, archaic art, still retained during the period of the 12 th century, was abandoned; the artists not only sought truth in the pose, but a flexibility in it, already distant from the rigidity of Byzantine drawing. The drawing became freer and the observation of nature more delicate. The example that we give here (Fig. 5), copied from a fragment of a painting of the end of the 13 th century,<sup>1</sup> explains in what consists this





this change or rather this advance in the art. Here three fourths of the head of the Virgin is finely drawn. The pose does not lack suppleness, the draperies are drawn with a freedom and remarkable breadth by means of a brownish red line.<sup>2</sup> One sees that the painter must have worked on a transfer that gave only a general mass, an outline and some principal features, and that the details have been rendered by the point of the brush. Even certain corrections have been left visible in the bottom of the mantle at the left side. Frequently these mural paintings are actual improvisations; those artists made cartoons only for subjects studied with exceptional care. Now to draw as a transfer a figure of natural size, it was necessary to possess sure and very certain methods.

Note 2.p.73. The coloring of this painting has almost entirely disappeared.

The Byzantine painters, neither then nor today made cartoons; they painted directly on the wall. During the middle ages in the West men proceeded in the same manner; this is what explains the absolute utility of the recipes given in the Guide de la peinture cited above, in the essay of the monk Theophilus, and in the treatise of Cennino Cennini. Besides, how did those artists, who covered in brief time very extensive surfaces, have time to make cartoons; at most they could prepare rough sketches at a reduced scale. During the 12<sup>th</sup> and 13<sup>th</sup> centuries, lines incised in the fresh plaster are seen only exceptionally, and those lines always indicate transfer from a cartoon; on the contrary, one frequently perceives light lines made with the brush, covered by the coating of color on which is laid the definite line, that is a mode of modeling. This definite line corrects and rectifies the primitive sketch, sometimes entirely modifying it, and we know scarcely any paintings of the 12<sup>th</sup>, 13<sup>th</sup> and 14<sup>th</sup> centuries without corrections.

The painters of the 12<sup>th</sup> century employed several kinds of paintings; fresco, size, egg, and oil painting. The last for lack of a dryer was only employed for small works; pictures on panels that one could easily expose to the sun. For the use of fresco painting, i.e., on a coating of fresh plaster, as we have just stated, the artist commenced by tracing with red ochre dissolved in pure water the masses of his personages,

then as with the foot some time forward the half time by and  
 - (very heavy) which shows that the water is not  
 - getting better, adding a further portion of lime as we come to  
 - the last coat; then with reddish brown mixed with black, we  
 - correct the outlines of the folds, the hollows, and the inter-  
 - val lines of the nose or of the eyebrows.  
 - This operation must be done rapidly, so as not to allow the  
 - plaster and the first coats to dry entirely. There must be an  
 - inflexion in the nose gives a softness and characteristic brillian-  
 - cy to this kind of work, and a modelling that even from an in-  
 - ferior clay coming to nearly pure white on the projecting or  
 - least parts, is neither dry nor discordant, even when exposed  
 - to some drying heat and carbonaceous in the lower tones. The a-  
 - skill of the operator consists in knowing exactly the de-  
 - grees of dryness to be left to each coat before applying a new  
 - one. If this time be too wet, the applied tone will be again  
 - and tones when it is a second, heavy and dirty white; if it be a  
 - too dry, the applied tone does not adhere nor join, and forms  
 - a dark ring on the outline. The blackish brown line, so neces-  
 - sary and that corrects the position of the internal forms, and  
 - the, white, etc., was given last when the modelling of the  
 - the nose was dry, so as to correct some vivacity and discor-  
 - dancy. Then it was shaded with white or with size from skins. This  
 - in those old times, one frequently sees this brown line de-  
 - signed in white, not forming a part of the contour.  
 - The use of lime as a base and even as a luminous addition to  
 - the mass, was almost the basis of the artistic method,  
 - such as the egyptian, classical and modern. It had recommended  
 - of only using the stone and a very small number of mineral  
 - colors, and to avoid the use of the artificial colors which were  
 - used, as to color, velocity. In the 18th century that harmony  
 - appeared too pure in comparison to the colored glass, but as  
 - have tones of (red) from intensity, and they were rendered  
 - these colors, so as to be able to employ the lead oxides,  
 - copper blues, and even lakes. Further, the aristocracy and  
 - and our scientific painting, it was necessary to find a pro-  
 - cess of coloring, that would facilitate the direct application  
 - of the colors, and which would be more rapid and less  
 - most common were - painted with oils, a sort of light and sub-  
 - die oiliness; consisting of size from skins or bones, also very



then he laid the local tone that formed the half tint by successive coats, mixing lime with the tint; he modeled the projecting parts, adding a larger portion of lime as he came to the last coats; then with reddish brown mixed with black, he redrew the outlines of the folds, the hollows, and the internal lines of the nude or of the draperies.

This operation must be done rapidly, so as not to allow the plaster and the first coats to dry entirely. This mode of painting in the paste gives a softness and particular brilliancy to this kind of work, and a modeling that even from an intense blue coming to nearly pure white on the projecting or light parts, is neither dry nor discordant, each superposed tone soaking into and participating in the lower tone. The skill of the practitioner consists in knowing exactly the degree of dryness to be left to each coat before applying a new one. If that coat be too wet, the applied tone wets it again and forms with it a spotted, heavy and dirty mud; if it be too dry, the applied tone does not adhere nor join, and forms a dark ring on its outline. The blackish brown line, so necessary and that accents the outlines of the internal forms, shadows, folds, etc., was often laid when the modeling by successive coats was dry, so as to obtain more vivacity and distinctness. Then it was sized with egg or with size from skins. Thus in those old frescos, one frequently sees this brown line detached in scales, not forming a part of the coating.

The use of lime as a base and even as a luminous addition to each tone, only allowed the painter to use certain colors, such as the earths, cobalt blue and green. That requirement of only using the earths and a very small number of mineral colors contributes to giving these paintings a very soft harmony, so to speak, velvety. In the 13<sup>th</sup> century that harmony appeared too pale in comparison to the colored glass, that gave tones of prodigious intensity, and they must renounce fresco painting, so as to be able to employ the lead oxides, copper greens, and even lakes. Further, the architecture adopted not permitting plastering, it was necessary to find a process of painting, that would facilitate its direct application to the stone. Indeed, various procedures were employed. Those most common are:- painting with eggs, a sort of light and stable dilution; painting of size from skins or bones, also very





durable when not exposed to dampness. The most stable is painting with resin dissolved in alcohol, but this quite expensive process was only employed for delicate works. Also sometimes men were contented with milk of lime applied as a base, on which one painted in water color before that coating of lime laid with brushes had dried. Painting with oil was very clearly indicated by the monk Theophilus, and was adopted before him, since he does not give himself as its inventor, but as we said before, it was employed only on panels, because of the time necessary to leave for each coating to dry in the sun, dryers not yet being in use.

Note 1.p.76. Theophilus says that "one could grind colors of all kinds with the same kind of oil (linseed oil), and place them on a work in wood, but only on articles that could be dried in the sun; for each time that a color is applied, you cannot apply another, if the first is not dry; which for images and other paintings is long and very wearisome." (Book I, Chapter 27).

Painting with gum was employed in the 12 th century, and seems to have been very frequently practised by the painters of the 13 th century for small objects, vases, woodwork, etc. "If you wish to hasten your work," says Theophilus,<sup>2</sup> "take the gum that oozes from the cherry or plum trees, and cutting it into small bits, place it in an earthen pot; pour in water abundantly, then expose it to the sun or indeed in winter on a gentle fire, until the gum is melted. Mix carefully with a stick and pass through a cloth; grind the colors with it and apply them. All colors and their mixtures can be ground and laid by the help of this gum, except red lead, and white lead and carmine, which must be ground and applied with white of egg." These paintings with gum or even with oil were habitually covered by a varnish composed of gum arabic dissolved in linseed oil by heat;<sup>3</sup> they had an extraordinary brilliancy.

Note 2.p.76. Book I, Chapter 27.

Note 3.p.76. Theophilus. Chapter 21.

The artists of the 13 th century, in painting subjects in halls fitted with colored glass, adhered to giving them a brilliancy and solidity of tone superior to the painting of ornament, and that could compete with the gold very frequently em-

embody them. To obtain this brilliancy, they must make use of bluish, and indeed the coloring of diamonds, when they are enclosed with some color, is chiefly obtained by applications of transparent colors on a preparation loaded in various ways like a mosaic. These glasses, either by traction or by traction, and the feeling for harmony (their glass is an even tint of color for every one). From the day that gold becomes a certain part of the description, it becomes necessary to modify the soft and light harmony suggested by the nature of the gold in contrast. Gold is a metal and not a color, and its presence on large surfaces in painting compels the painter to arrange the entire scale of his colors. Gold has very vivid and light reflections, very strong half tones and shadows of an intermediate and warm, but when all colors become gray in light, of course and heavy in dark. To be able to compete with these so brilliant lines and colors with lines of gold so with, very strong colored tones are necessary, but which are to appear black must retain the transparency of a water color. Thus we created the small subjects described the artists of the 19th century. The quality of the paint is of the first importance, and is absolutely necessary on a ground prepared with white or of mixed colors, very colored and very light, then combined by a very vivid transparent coloring and more lines. Let with all, all these tones were not placed in the same manner; blue and light (transparent) green and gray, and so applied as a mosaic of colors (blue, green, gray, etc.) and yellow, and to be modified as a glass to retain a brilliant and able to compete with the half tones of gold. This glass seems to have been attacked by means of various shades, but was only by the aid of that various composed of finished oil and varnish. It is the varnish which is the key, and it is time and is applied on a very thin layer of time; yet it is not the same, for this painting requires and forms a glass.

Note 1. p. 77. We have examples of the effect that gold produces on the colors, those with and on every body with oil. White objects on a gold ground appear dirty, gray and dull, and the flesh is heavy. The only tones that sustain themselves on gold grounds are the transparent tones that can be obtained by glazing. And also it is necessary to make on the gold either a network, a strong lattice or a mosaic. The use



employed then. To obtain that brilliancy, they must make use of glazing, and indeed the coloring of figures, when they are produced with some care, is chiefly obtained by applications of transparent colors on a preparation modeled in strong relief like a stucco. Those artists, either by tradition or by instinct, had the feeling for harmony (their glass is an evident proof for every one). From the day that gold became a strong part of the decoration, it became necessary to modify the soft and light harmony adopted by the painters of the 12th century. Gold is a metal and not a color, and its presence on large surfaces in painting compels the painter to change the entire scale of his tones. Gold has very vivid and light reflections, very bright half tints and shadows of an intensity and warmth, near which all colors become gray if light, obscure and heavy if dark.<sup>1</sup> To be able to compete with these so brilliant lights and those half tints of Gold so warm, very strong colored tones are necessary, but which not to appear black must retain the transparency of a water color. Thus were treated the small subjects decorating the arcade of the upper S. Chapelle of the palace at Paris. Those subjects, that are alternately detached on a ground damascened with gilding or of netted gold, were painted very light, then enhanced by a very vivid transparent coloring and brown lines. Yet with gold, all these tones were not treated in the same manner; blues and light (turquoise) greens are pasty, and so applied assume a strongly coloring value; while reds, dark greens, purples and yellows, need to be applied as a glaze to retain a brilliancy able to compete with the half tints of gold. This glazing seems to have been stuck by means of resinous gluten, perhaps only by the aid of that varnish composed of linseed oil and gum arabic. As for the painting underneath or paste, it is fine and is applied on a very thin layer of lime; yet it is not fresco, for this painting scales and forms a glaze.

Note 1. p. 77. We have examples of the effect that gold produces beside fresco tones, those with wax or even pasty with oil. White vestments on a gold ground appear dirty, gray and dull, and the flesh is heavy. The only tones that sustain themselves on gold grounds are the transparent tones that can be obtained by glazing. And also it is necessary to make on the gold either a network, a strong lattice or a mosaic. The vou-

counts of the stones pointed by Harnack in the Vatican supply  
us with observations of great interest in that respect; but  
toulouly that of the hall of the disputation on the holy sac-  
rament. The gold grounds are cracked like mosaic, and the  
fresco subjects have a sort of coloring, that could only be  
obtained by retouching, either with oil or in some manner ap-  
plied with staining. The same observation can be made in the  
library of St. Peter, by examining the original count of church &  
S. Maria del Popolo, attributed to Pinturicchio.

It was therefore necessary to restore the original  
program on gold grounds, to fill the undersides of the one-  
sided or double-sided pictures, to give them a very  
low toned reddish brown. Then the coloring was only a very  
translucent glaze laid on the metal, and with very intense  
tones they avoided heaviness. These tones participated with  
the ground, and obtained something of its metallic splendor.  
The degrees of painting in which gold plays an important  
role, the difficulties and consequences of involving this me-  
tal, which restricts the painter at every step to retaining  
everywhere a brilliant harmony, very sustained without fall-  
ing into heaviness, cannot but be about the end of the 15th  
century, as we have seen, that men frequently adopted the  
system of grisaille. They went as far in the coloring of the  
end about the middle of the 16th century; that was the point  
where the painters had to give to the tones of their paint-  
ings such brilliancy and intensity, that it was necessary to  
recourse. Then again glass was used in grisaille or they used  
limber and translucent coloring; gold no longer plays in  
the picture as a very important part, and the colors were  
colored in soft and very light tones, and to avoid the flat  
and faded effect of these scarcely illuminated reliefs, they  
were decorated by very strong contrasts, black, reddish brown,  
lustrous blue, often contrasted with drab, tone on tone or a  
tinted tinge of varied colors, but obtaining a very vigorous  
mass. They obtained little from the perspective of contrasts, but  
continued to give the accessories, like carvings and furniture,  
an actual appearance. Gradually the field of imitation ex-  
tended; after having painted only objects directly touching the  
picture, they began to paint the floor, the ceiling, the  
placed an entrance, door or tree on a secondary plane; each



vaults of the Stanze painted by Raphael in the Vatican supply us with observations of great interest in that respect; particularly that of the hall of the disputation on the holy sacrament. The gold grounds are cracked like mosaics, and the fresco subjects have a vigor of coloring, that could only be obtained by retouching, either with egg or in some manner applied with glazing. The same observation can be made in the library of Siena, by examining the apsidal vault of church S. Maria del Popolo, attributed to Pinturicchio.

It even frequently occurred to artists painting subjects or ornaments on gold grounds, to gild the underside of the ornaments or draperies intended to be colored red, purple or yellow tenced reddish brown. Then the coloring was only a very transparent glaze laid on the metal, and with very intense tones they avoided heaviness. Those tones participated with the ground, and retained something of its metallic splendor.

The dearness of paintings in which gold plays an important part, the difficulties and consequences of employing this metal, which restricts the painter at every step to retaining everywhere a brilliant harmony, very sustained without falling into heaviness, caused that about the end of the 13th century, as we have stated, that men frequently adopted the system of grisaille. They went so far in the coloring of glass about the middle of the 13th century; that crushing coloration had led painters to give to the tones of their paintings such brilliancy and intensity, that it was necessary to recede. Then much glass was made in grisaille or they used lighter and translucent coloring; gold no longer plays in painting but a very secondary part, and the subjects were colored in soft and very light tones, and to avoid the flat and faded effect of these scarcely illuminated reliefs, they were supported by very strong grounds, black, reddish brown, intense blue, often charged with drawings, tone on tone or damascenings of varied colors, but presenting a very vigorous mass. They thought little then of perspective grounds, but commenced to give the accessories, like chairs and furniture, an actual appearance. Gradually the field of imitation extended; after having painted only objects directly touching the figures, according to their form and true dimensions, then placed an edifice, floor or tree on a secondary plane; then

believe to be one of the essential conditions of monumental art, is the presence of a historical object, which is not so produced in nature, and that their position always rests, of the distribution of the light on a principal point, and that the effect of light is not to be lost, but to be used in the most judicious manner.

Article, on the painting of windows in oil. It is a very good article, and I have no doubt that it will be of great value to those who are interested in the subject. The article is written in a very clear and concise manner, and it is well illustrated with many fine reproductions of the work of the great masters. It is a very good article, and I have no doubt that it will be of great value to those who are interested in the subject.

a fairly high average of 100, but which never remains in-  
 less or condition, possibly defects or exaggerates them. It is  
 as though the subject, when it is in a position to observe  
 light or dark, changes or assumes its proportion; whereas in  
 cooperative painting of figures or objects, makes it  
 essentially variable because of the location of the object.  
 become difficult to apply, precisely because the laws are a  
 constructive analysis is further necessary of the way in which



finally the conventional and purely ornamental grounds disappeared, to give place to a real interpretation of the place or the scene that occurred. Yet it is necessary to state that if the painters before the 16<sup>th</sup> century sought to give an actual representation of the place, as we have already stated, they did not think of aerial perspective nor of the effect, i.e., of the distribution of the light on a principal point, nor to produce illusion, and that their paintings always retained the appearance of a decorated plane surface, which we believe to be one of the essential conditions of monumental painting.

We cannot extend farther, without leaving the scope of this Article, on the painting of subjects in edifices. Besides we shall have occasion to return to some points concerning painting in Articles Style and Vitrail. We shall now pass to the painting of ornament, to painted decoration properly so-called. There is reason to believe that on this important part of the art, the artists of the middle ages had only traditions and daily experience, but few or no theories. The treatises on painting only occupy themselves with the material means, and do not enter into considerations on the art, on the methods to be employed in certain cases. For us, who have absolutely lost those traditions, and who possess only a very limited experience of the decorative effect of painting, we must necessarily base ourselves on the observation of past examples to restore certain theories resulting from that experience and those traditions. It would be useless to our readers to know that such an ornament is yellow or blue, if we do not explain why it is yellow here and blue there, and how it produces a certain effect in one or the other case. Decorative painting is before all a question of harmony, and there is no harmonic system, that cannot be explained.

Decorative painting is further one part of the art of architecture difficult to apply, precisely because the laws are essentially variable because of the location of the object. Decorative painting enlarges or dwarfs an edifice, makes it light or dark, changes or accents its proportions; causes it to recede or approach, makes it pleasing or wearisome, separates or combines, conceals defects or exaggerates them. It is a fairy that lavishes good or bad, but which never remains in-

He is a man of a very different type from the one who has been described in the preceding pages. He is a man of a very different type from the one who has been described in the preceding pages. He is a man of a very different type from the one who has been described in the preceding pages.



indifferent. At its pleasure, it enlarges or lessens columns, lengthens or shortens piers, raises the vaults or brings them nearer the eye, enlarges or diminishes the surfaces; charms or offends, concentrates the idea in one impression or distracts and occupies without cause. By a stroke of the brush it destroys a wisely conceived work, but also of a humble edifice it makes a work full of charm, of a cold and bare hall, a pleasant place where one loves to dream, and retains an inefaceable memory.

In the middle ages were required to execute those prodigies, excellent masters, such as each city supplies one or two? Certainly not; it required only some working painters acting on the principles derived from long observation of the effects, and that can be produced by the assemblage of colors and the scale of the ornaments. Then the poorest village church white-washed with some touches of painting was a work of art, just like the S. Chapelle, and there were not seen in the midst of the same civilization works of art of great value or at least of surprising richness, and at some steps from there those distressing decorative paintings, that dishonor the walls that they cover, and cause to blush all men of taste that see them.

As everyone knows, there are only three colors, yellow, red and blue; white and black being two negations; the white being uncolored light and black the absence of light. From these three colors are derived all tones, i.e., infinite mixtures. Yellow and blue produce greens, red and blue the purples, and red and yellow the oranges. In these colors and their mixtures the presence of white and black increases the light or lessens it. Precisely because white and black are two negations and are foreign to the colors, they are destined in decoration to accent the values. White radiates, black emphasizes and limits radiation. The decorative painters of the middle ages, either by instinct or rather by tradition, never colored without a complement of white or black, often with both. Passing from the simple to the compound, we shall explain their methods. We shall speak only of the painting of interiors, of those lighted by diffused light; we shall occupy ourselves in the last place with external painting, i.e., lighted by direct light. During the period of the middle ages, when monumental painting plays an important part, we observe that the artist





adopts at first a tonality from which he does not depart in the same place. Now these tonalities are not numerous and reduce to three: the tonality obtained by yellow and red with the luminous and dark complement, i.e., white and black; the tonality obtained with yellow, red and blue, which necessarily brings in the intermediate tones, i.e., green, purple and orange, always with the complement of white and black, or black alone; the tonality produced by the aid of all tones given by the three colors, but with as complement, black as the dark element, the luminous reflections of gold in this case replacing the white.

Assuming that the value of yellow is 1, red is 2 and blue 3; mixing yellow and red we obtain orange with the value 3; yellow and blue give green with the value 4; red and blue make purple with value of 5. If we place these colors on a surface, so that a harmonious effect be not exceeded, using only yellow and red, it is necessary that the area occupied by the yellow be at least double the area occupied by the red. But if we add blue at the time, the harmony becomes more complex; the presence of blue alone requires, either a considerable relative increase of the yellow and red areas, or the complement of green and purple tones, which for green should not exceed one fourth, and for purple not over the fifth of the total surface. These are the elementary rules of the harmony of the decorative painting of the artists of the middle ages. Also they have rarely admitted all the colors of the tones derived from their mixture, because of innumerable difficulties resulting from their juxtaposition, and from the relative importance of the area, that must be occupied by each of those tones. In the case of adopting the three colors and their derivatives, gold becomes an indispensable complement, for it is charged with completing or even reestablishing the harmony. Returning to the simplest principles, one can obtain a perfect harmony with yellow and red (red ochre), especially with the aid of the white complement; it is impossible to obtain a harmony with yellow and blue, or even with red and blue, without the complement of the intermediate tones. If you would decorate a hall <sup>with an</sup> entirely white background with red and blue or yellow and blue ornaments, even if sprinkled, harmony would be impossible. Red (red ochre) and yellow (yellow ochre) being the only two

The observation of other principles as elementary was no less familiar to these artists. For example, they had noticed that the same form of ornament in white or a light tone on a black ground, or black on a light ground, changed its appearance. To make themselves fully understood (Fig. 1), let us take a certain brown surface on a white ground, as being smaller than the white surface, the former one removes from the painted surface, and the surface occupied by the white ground will seem larger than that occupied by the brown ground. But there be two distinct of the same white and the same surface; if one of them be decorated by vertical lines, as a distance it will appear taller and narrower than the one decorated by horizontal bands. And to return to the red being assumed to be 2 and blue 3, the red must seem cooler by a larger area than the blue to obtain harmony between these two colors; if (Fig. 2) the surface be decorated by vertical lines it will be possible to have a harmonious surface; but on the contrary if the ground is blue and the surface are red, the red will be so shocked, that it cannot remain as instant on the red surface, and assumption of the two colors in the last combination will cause the surface to waver to the point of causing vertigo. Everyone can make this experiment by employing the same variation for red and blue surface for the blue. Not only do the colors have an absolute value, but also a relative value from the place that they occupy, and the area that they cover; therefore, they modify the actual area of the color and according to the form of the ornament that they color. In the simplest formula, that in which yellow (cool) and red (warm) are employed, it is clear that one of the two colors, the red one, has more intensity than the yellow; but if to those two colors we add blue, it is necessary for the value of the red and blue to be different, for the red yields to the blue, or which is more natural, that the blue yields to the red. Thus it is the brownish red that may be added to the blue; if we add (further almost by force) tones derived from these colors, like green and orange, it is



colors than can find themselves together without the complement of other tones.

The observation of other principles as elementary was no less familiar to those artists. For example, they had recognized that the same form of ornament in white or a light tone on a black ground, or black on a light ground, changed its dimensions. To make ourselves fully understood (Fig. 6), let at A be reddish brown squares on a white ground, at B being white on a reddish brown ground; the brown squares will appear smaller than the white squares, the farther one removes from the painted surfaces, and the surface occupied by the white ground will seem larger than that occupied by the brown ground. Let there be two pilasters of the same widths and the same heights; if one of them at C be decorated by vertical lines, at a distance it will appear taller and narrower than that at D ornamented by horizontal bands. And to return to the preceding observation on the harmonic value of the colors, red being assumed to be 2 and blue 3, the red must then occupy a larger area than the blue to obtain harmony between these two colors; if (Fig. 6) the squares A be blue on a red ground, it will be possible to have a harmonious surface; but on the contrary if the ground is blue and the squares are red, the eye will be so shocked, that it cannot remain an instant on that surface; the assemblage of the two colors in the last conditions will cause the outlines to waver to the point of causing vertigo. Everyone can make this experiment by employing pure vermilion for red and ultramarine for the blue. Not only do the colors have an absolute value, but also a relative value from the place that they occupy, and the area that they cover; further, they modify the actual areas of the colors according to the form of the ornament that they color. In the simplest tonality, that in which yellow (ochre) and red (ochre) are employed, it is clear that one of the two colors, the red ochre, has more intensity than the yellow; but if to those two colors we add blue, it is necessary for the value of the red and blue to be different, for the red yields to the blue, or which is most natural, that the blue yields to the red. Thus it is the brownish red that must be admitted and light blue; if we add (further almost by force) tones derived from these three colors, like green and purple, it is





equally necessary to establish these tones and these colors according to the different values, i.e., to never have two tones of equal values. It no longer concerns the surface occupied but the intensity; now that intensity is optional. If when we employ only the three colors, the red must be brownish red and have the greatest intensity, employing with these three colors the derivatives, the red must become pure, i.e., vermilion, because brownish red can harmonize neither with green nor with purple; the addition of the derived tones require the colors to be pure if one employs them. Still it is well for the primary value to be left to a color rather than to a tone; this primary color cannot be given to yellow, it will be the red tone (vermilion), or the blue that I will assume it (usually blue). Let us assume that this be the intense blue that has the primary value; the painters of the middle ages refrained from giving a second value to another color, i.e., to red; they assigned it to a tone, most frequently green and sometimes purple. Then comes the third value, which will be the red (vermilion); then between this color and the yellow is another tone, habitually purple, sometimes green. After the yellow come the inferior values, very light purples (rose), light blues, turquoise greens, straw yellows, milky white and grays. For below the lowest color value, which is necessarily yellow ochre are required tones, never the scale of values ending with a color, as it rarely does not commence by a tone.<sup>1</sup> These principles being known, there still remain a number of rules of a secondary order, that these artists of the middle ages scrupulously observed. We shall cite some of them. Intense blue being hard and cold, the painters frequently have it a little greenish, and have relieved it by spots of gold; they they have nearly always placed beside it a vivid red (vermilion), then after the red a light green or even a bluish or greenish white, black lines further separating each tone of color. Blue in direct contact with yellow produces an equivocal effect, and red or purple is interposed. Slaty gray blue alone can lie on a yellow surface. Green is often placed in direct contact with blue, and this is a dissonance employed with rare skill, but then the green inclines to yellow or blue and the green is dark. The purples have in area the value 5, and consequently must occupy the smallest fi-





field in the painted decoration, never approaching violet; this false tone being absolutely excluded, it inclines toward orange or madder. We have frequently observed how ingenious is nature in the harmonious combination of the tones of plants; thus for ten geraniums or hollyhocks that have flowers of different reds or purples, we shall see ten different green tones for the leaves, all green tones being each combined for the red or purple that they surround. Had the painters of the middle ages studied the secrets of the harmony of tones from nature? We do not know; but how is it that those secrets are lost, or that women alone possess them, when it concerns their attire? Why when it is necessary to paint a hall, do our artists seem to apply colors by chance, producing in the entirety a false harmony almost always? Is this from lack of principles, traditions and practice? It is certain that in the difficult art of painted decoration instinct does not suffice, as some think, and that in this important part of architecture, reasoning and calculation intervene as in all others, for lack of a long series of traditions.

Note 1.p.88. The S. Chapelle of the palace presents the most curious example of this chromatic scale. In spite of the numerous and broad traces of the old tones, the difficulties were numerous in the restoration of the paintings; it was necessary to make the tones many times over, for lack of consummate experience. On placing a tone whose trace was certain, it was frequently necessary to change the value of the upper or lower tones.

The simplest decorative painting, that requiring the fewest combinations, is that obtained with yellow ochre, red ochre or brownish red, black, white and gray, a mixture of the two. This painting is only a drawing, so to speak, a grisaille of a warm tone, yet it can already produce very varied effects. Yellow ochre and red ochre are two colors of the same family, so to speak, that always harmonize without difficulties. Whether you paint a yellow ornament on brownish red, or a brownish red ornament on a yellow ground, whatever be the form or dimensions of the ornament, it will not make a spot; but if you enhance the yellow or brownish red ornament by black or white lines, you will then obtain effects of extreme delicacy and rich in tone. This observation can be made in the halls

the ground story only consists of a pointed arch in white with brownish white bands on a ground of yellow ochre. The sides of the arch are white (see detail section at A, Fig. 7) of a square arch with rounded ornament from a to b and from b to c, and a molding whose members are alternately painted red and yellow ochre. We give at A, B, and C, the assortment of these rounded ornaments on the two faces of the square arch. That at B is brownish red on an ochre ground with broad black lines on the sides of the leaves and a white line at an equal distance from the sides, laid on the sides of the black line. That at C is darkest yellow (yellow color mixed with red ochre) on yellow ochre ground outlined by very dark brownish red lines and white lines inside the arch; white spots are further moved on the yellow ground; that at B is brownish red outlined by a white line on yellow ground with black spots on the sides of the leaves and a white line at an equal distance from the sides, laid on the sides of the black line. It is unnecessary to state that the same ornament is found on each side arch on the faces A, B, and C and is detailed. Some green cones are seen on the capitals of this hall and variation tones on the ribs of the vaults, but there is an absence of blue, gray sometimes appearing east a color. Green and black gray enter into this scheme in various without difficulty, and it seems that the details of the 12th century and the beginning of the 13th are struck from the use of blue, which as we have just stated, strongly requires the use of tones varied between blue and red, or blue and yellow. There exist in the edifices known at Portiers of the name of the temple of St. Jean, paintings of the 12th century that present the most combinations of simple harmony. One of the surfaces of the principal hall presents with figures colored yellow, light brown brown, green, grayish green and a gray gray, bands of which we give two specimens. That at A forms the lower frieze below the carpentry, that at B takes the place of the raised wall below the windows. The band A is composed of an ochre first colored brownish red, yellow ochre and green on a milky white ground. A white line forms the front edge of the frieze. The tone of the frieze is modeled by means of parallel horizontal and a darker tone, white as they



of the keep of Coucy. The painted demoration of the hall of the ground story only consists of a jointing traced in white with brownish white bands on a ground of yellow ochre. The side arches of the vault consist (see their section at A, F Fig. 7) of a square angle with running ornament from a to b and from b to c, then a moulding whose members are alternately painted red and yellow ochre. We give at B, B' and B'', three specimens of these running ornaments on the two faces of the square angle. That at B is brownish red on an ochre ground with broad black lines on the edges of the leaves and a white line at an equal distance from the edge, laid on the middle of the black line. That at B' is darkened yellow (yellow color mixed with red ochre) on yellow ochre ground outlined by very dark brownish red lines and white lines inside them; white spots are further noted on the yellow ground; that at B'' is brownish red outlined by a white line on yellow ground with slaty gray bands G. The effect of this ornamentation is most brilliant. It is unnecessary to state that the same ornament is found on each side arch on the two faces a b, b c, and is doubled. Some green tones are seen on the capitals of this hall and vermilion tones on the ribs of the vaults, but there as an absence of blue, gray sometimes replacing that color. Green and slaty gray enter into this simple harmony without difficulty, and it seems that the artists of the 12 th century and the beginning of the 13 th shrank from the use of blue, which as we have just stated, directly requires the use of tones varied between blue and red, or blue and yellow. There exist in the edifice known at Poitiers by the name of the temple of S. Jean, paintings of the 12 th century that present the richest combinations of simple harmony. One of the surfaces of the principal hall presents with figures colored yellow, light reddish brown, green, grayish green and slaty gray, bands of which we give two specimens. That at A forms the upper frieze below the carpentry, that at B taking the place of the raised sill below the windows. The band A is composed of an oblique fret colored brownish red, yellow ochre and green on a milky white ground. A white line forms the front edge of the fret. Each tone of the fret is modeled by means of parallel hatchings and a darker tone, wider as they approach the lower border of each oblique face. The tones are

marked glass; brownish red by the latter B; yellow by A, green  
by C. The white dots are regularly placed on the upper and lower  
horizontal bands. At least seven in the 12 in square window  
dots (beads) are very frequently employed on brownish red  
and yellow tones, frequently as a transition between the two; this  
was one means for giving an affected appearance to the paint-  
ing for removing their distance from possible tones. It is well  
to note that the brownish red of these paintings are of tem-  
perable brightness, transparent and vivid, without having the  
harshness of red (vermillion). The second example that we give  
at B is on a light blue grey ground; the values are yellow,  
and the firsts are light brownish red with the middle a dark brownish  
red; these yellow and red ornaments are bordered by a  
white line. The harmony of the colors of this specimen is of  
extreme delicacy and at the same time very solid. When painted  
at least seven, i.e., during the 12 in and containing of the 12  
in center, most edifices not only in the interior but on  
the exterior, and the harmonic system of these paintings is  
always based on this simple system, with rare exceptions. Y  
Yet they were made a quantity of stained glass, that applied  
the greater richness in color as the window became larger.  
(See. Vitrail). It is with windows of small dimensions filled with  
white or very light blue, under a brilliant and not ex-  
cessive light, it was natural and even necessary to give the de-  
cative painting a both brilliant and soft appearance, when  
men assumed the habit of placing extremely colored glass be-  
fore the windows intended to light the interiors, that light paint-  
ing in transparent tones was completely extinguished by the  
intensity of the tones of the new glass. Blue and red entering  
for a great part into the transparent coloring of the glass,  
became grey and dull, the white disappeared or assumed rainbow  
tints. With the colored glass were required brilliant tones  
on the walls, and again for these tones to have their value,  
they must be accompanied and outlined with black like the co-  
lors of the interior. The harmony of decorative painting of interiors was modified.  
If by reason of economy there were retained large areas of  
fades, accounted only by dots; the bands, ribs of white, there



marked thus; brownish red by the letter R; yellow by J, Green by V, slaty gray by BG. The birds are brownish red and yellow. The white dots are regularly placed on the upper and lower horizontal bands. At that epoch in the 12 th century white dots (pearls) are very frequently employed on brownish red and yellow tones, frequently astride between the two; this was one means for giving an affected appearance to the painting for removing their ~~opacity~~ <sup>brilliance</sup> from absolute tones. It is well to note that the brownish reds of these paintings are of remarkable brightness, transparent and vivid, without having the hardness of red (vermilion). The second example that we give at B is on a light slaty gray ground; the values are yellow, the florets are light brownish red with the middle a dark brownish red; these yellow and red ornaments are bordered by a white line. The harmony of the tones of this specimen is of extreme delicacy and at the same time very solid. Men painted at that epoch, i.e., during the 12 th and beginning of the 13 th centuries, most edifices not only in the interior but on the exterior, and the harmonic system of those paintings is always based on this simple system, with rare exceptions. Yet they made a quantity of stained glass, that acquired the greater richness in color as the windows became larger. (Art. Vitrail). If with windows of small dimensions filled with white or very light glass, under a diffused and not extensive light, it was natural and even necessary to give the decorative painting a both brilliant and soft appearance, when men assumed the habit of placing strongly colored glass before openings intended to light the interiors, that light painting in transparent tones was completely extinguished by the intensity of the tones of the new glass. Blue and red entering for a great part into the translucent coloring of the glass, gave an equivocal appearance to the ochre tones, the greens became gray and dull, the white disappeared or assumed rainbow tints. With the colored glass were required brilliant tones on the walls, and again for these tones to have their value, they must be accompanied and outlined with black like the colored glass itself. Thus we see that during the 13 th century the harmony of decorative painting of interiors was modified. If by reasons of economy there were retained large light surfaces, occupied only by bands; the bands, ribs of vaults, their

specimens, and especially colored, and that coloring is more p-  
 brilliant, the latter they are from the east. We have a remark-  
 able example of this transition from the narrowest section of  
 decorative painting in the old church of the twelfth of April,  
 built about the middle of the 13th century. This church,  
 according to the custom established by the order of St. Dominic,  
 consists of two naves separated by a row of piers. Painted w-  
 ith harmoniously, yet one nave and the other desired to ans-  
 wer the brilliant effect of the glass, that formerly filled  
 the windows. Each bay of west wall (Fig. 9) consists of a tri-  
 cor flanked by the gabled piers and the side arm of the nave.  
 It is a relatively narrow window which opens in the middle of that d-  
 tracted. At its left a uniform dark tone with bands; above is  
 traced a jointure in brownish red on a white ground from 8 to  
 5. A band is painted at 0; the parchment over that band is cov-  
 ered by a white ground with two series of arms. This paint-  
 ing is then of extreme simplicity; the vaults are raised; not  
 only are the ribs colored as well as the bosses, but beneath  
 the tracery of the filled tracery from the central boss  
 to the crown of the ribs appears the wide bands A (Fig. 10).  
 covered by painted ornaments of beautiful designs. As for the  
 triangles B, they are only occupied by horizontal lines in brown-  
 ish red on a white ground. Now it is necessary to observe  
 that the blue color only appears in the ornaments and on the  
 bands of arms. All the designs receive no other tones than  
 yellow, brown, black and white colors. This is  
 Fig. 11. The bands indicated at 0 in the bay, Fig. 9, are col-  
 ored in two tones, yellow, brown and brownish red with white  
 bands and black ground. The stems of the scrolls are alternately  
 yellow and red, as well as the leaves and the branches  
 of grapes. The yellow leaves are outlined with red and black  
 on a white ground, the red leaves are laid flat. Two wide bands  
 are yellow inside and red outside and stop the black ground.  
 These bands vary in design in each bay, while retaining the  
 same harmony. The tips of the vaults, whose section is given  
 at 8, Fig. 12, are each covered by varied ornaments, two ap-  
 pears of which we give at 0. These ornaments only account  
 for half the section, i.e., for the design 8, the middle of  
 the rib being at 0. The other half is at 0. For the rib 8 the space is parol, bordered by lat-



tympanums, are strongly colored, and that coloring is more brilliant, the farther they are from the eye. We have a remarkable example of this transition from the harmonic system of decorative painting in the old church of the Jacobins of Agen, built about the middle of the 13<sup>th</sup> century. This church, according to the custom established by the order of S. Dominic, consists of two naves separated by a row of piers. Painted with simplicity, yet one sees that the artist desired to sustain the brilliant effect of the glass, that formerly filled the windows. Each bay of that wall (Fig. 9) consists of a diaper limited by the engaged piers and the side arch of the vault. A relatively narrow window opens in the middle of that diaper. At A is laid a uniform dark tone with bands; above is traced a jointing, in brownish red on a white ground from B to C. A band is painted at D; the tympanum over that band is occupied by a white ground with two shields of arms. This painting is then of extreme simplicity; the vaults are richer; not only are the ribs colored as well as the bosses, but beneath the intrados of the filling triangles from the central boss to the crowns of the side arches are wide bands A (Fig. 10), covered by painted ornaments of beautiful designs. As for the triangles B, they are only occupied by jointing traced in brownish red on a white ground. Now it is necessary to observe that the blue color only appears in the ornaments and on the shields of arms. All the diapers receive no other tones than yellow ochre, brownish red, black and milky white. Thus in Fig. 11 the bands indicated at D in the bay, Fig. 9, are colored in two tones, yellow ochre and brownish red with white parts and black grounds. The stems of the scrolls are alternately yellow and red, as well as the leaves and the branches of grapes. The yellow leaves are outlined with red and black on a white ground, the red leaves are laid flat. Two wide bands are yellow inside and red outside and stop the black ground. These bands vary in design in each bay, while retaining the same harmony. The ribs of the vaults, whose section is given at S, Fig. 12, are each covered by varied ornaments, two specimens of which we give at G'H. These ornaments only account for half the section, i.e., for the design G, the middle of the rib being at a', the edge b falls at b', and the edge c at c'. For the rib G the stars are purple, bordered by int-

internal white and external black lines; the eye is yellow and bordered by black; the ground is intense olive (laid). For the tip of the leaves the yellow bordered by internal white and external black lines; the foresees are white with yellow bordered by a black line; the ground is alternately intense blue and red; green appeared on other ribs. As for the parts from the center of the triangles, we give a specimen in fig. 13. All these parts are varied, but all have the design repeated on a black ground; the feet are brownish red, intense blue and white with a white line on the front edge. The scales are white with some spots in very light blue, marked by means of brownish red markings. The harmonic system of a coloring of this sort, -- for this system is properly only half with two halves, -- is first, -- for the vertical parts, yellow and blue, the simplest harmony, then given by yellow and red tones on white ground with black lines; but for the variety, further from the eye and that could be seen only through the atmosphere colored by the light passing through the eye, a primary in which light blue and intense blue intervened, and consequently purple and green, the whole suggested by black triangles and lines, black grounds for the bands of the triangles of the variety, black lines only to outline the elements of the ribs. Indeed, the black outlines become necessary when one passes to a narrow process of the eye, yellow, red and blue with black intervening; for if there is such a great difference in value between yellow and red, it is not necessary to separate them by a black line, it was not so when were placed each other two colors with values little different, like purple and blue, olive and red, intense blue and yellow, green and purple, etc.; the black line then becomes absolutely necessary to prevent the wavering of one tone on the other, and consequently the decomposition of one of them. Thus if you place a blue tone directly beside a purple tone, you will make the purple grayish and doubtful if the blue is intense, or the blue will be light water or even lilac if the purple is vivid. The further distant one is from the painted object, the more complete will be this decomposition of one of the two tones, and sometimes of both. But if between these blue and purple you introduce a black line and even a



internal white and external black lines; the eye is yellow and bordered by black; the ground is intense blue (indigo). For the rib H the leaves are yellow bordered by internal white and external black lines, the rosettes are white with yellow eye bordered by a black line; the grounds are alternately intense blue and red; green appeared on other ribs. As for the bands from the bosses of the triangles, we give a specimen in Fig. 13. All these bands are varied, but all have the design detached on a black ground; the frets are brownish red, light blue and white with a white line on the front edge. The palms are white with some parts in very light blue, modeled by means of brownish red hatchings. The harmonic system of coloring of this hall,-- for this church is properly only a hall with two naves,-- is this:-- for the vertical parts, walls, piers and diapers, the simplest harmony, that given by yellow and red tones on white ground with black touches; but for the vaults, farther from the eye and that could be seen only through the atmosphere colored by the light passing through glasses in brilliant tones, a harmony in which light blue and intense blue intervened, and consequently purple and green, the whole enhanced by black grounds and lines: black grounds for the bands of the triangles of the vaults, black lines only to outline the ornaments of the ribs. Indeed, the black outline became necessary when one passed to a harmony composed of three colors, yellow, red and blue with their derivatives; for if there is such a great difference in value between yellow and reddish brown, that it is not necessary to separate the brownish red from yellow ochre by a black line, it was not so when were placed beside each other two colors with values little different, like purple and blue, blue and red, light blue and yellow, green and purple, etc.; the black line then becomes absolutely necessary to prevent the wavering of one tone on the other, and consequently the decomposition of one of them. Thus if you place a blue tone directly beside a purple tone, you will make the purple grayish and doubtful if the blue is intense, or the blue will be light azure or even lilac, if the purple is vivid. The farther distant one is from the painted object, the more complete will be this decomposition of one of the two tones, and sometimes of both. But if between this blue and purple you interpose a black line and even a u

[illegible]

The descriptive literature of the Middle Ages is not a  
-passion for knowledge of the value of things, and their in-  
-crease of their history; and if the literature is in our  
-hand of knowledge so far as it is not to be attributed to those  
-characters, but to our nearly complete ignorance of these things.



white line doubling the black, as in example G (Fig. 12), you will isolate each tone and will restore their value to each; they influence each other without confusing and consequently injuring each other; they contribute to a harmony, precisely because each retains its own quality, and that they act, (excuse the word) in the fullness of that quality. For an accord to occur in music, it is necessary for each of the given notes to concur in the accord and to be accurate; but if a single note be false, the accord will not exist. Well! It is the same in decorative painting; for an accord to exist, it is necessary that each tone must retain all its purity on its own part; for it to preserve this, it is essential that its coloration or value be not falsified by the mixture of an adjacent tone, a mixture especially made at a distance, if one has not taken care to enclose each tone by black, which is not a tone. White alone will be insufficient to produce this effect, because white is colored and affected by the radiation of adjacent tones. Black is absolute and it alone can enclose each tone. It is then necessary to establish between the tones of a decorative painting that harmonic scale of values mentioned above, but it is also necessary to take into complete account the more or less pronounced radiation of these tones; a radiation that increases with the distance at which the eye is placed. Thus for example, blue radiates more than any other color. A blue touch on a yellow ground and near the eye scarcely changes the yellow; at a distance the same blue touch will make the yellow appear dirty green and the blue grayish. If the blue touch be outlined by a black line, the yellow will be changed less; if between the blue touch and the yellow you interpose a black line and a reddish brown line, the yellow ground will retain its real value, and the brownish red will entirely outline the blue, which will remain pure.

The decorative painters of the middle ages carried as far as possible this knowledge of the value of tones, and their influence of their harmony; and if the attempts made in our days have scarcely succeeded, it is not to be attributed to those painters, but to our nearly complete ignorance of these matters. The simple harmonic system for the vertical parts nearest the eye, already compound for the vaults, employed in the chu





church of the Jacobins of Agen, establishes a transition most interesting to observe. The decorators of that hall were sparing with blue, and yet employing it only on very small surfaces, they have immediately accepted purple, green and black lines. They admitted only two blue tones, intense blue (value of indigo but less azure), the light blue (cobalt mixed with white); as for the purple, it is brilliant, like what one could obtain with glazing madder lake with a dot of mineral blue on a base of mine-orange applied light. The green touches, also very rare, are vivid and tend to yellow. The brownish reds are brilliant, having a value of vermilion with more transparency. The yellows are of the most beautiful ochre mixed with a dot of vermilion. There is not a bit of gold; this is because gold is required by the presence of blue on a large area. We have just stated, that blue is a color that radiates more than any other, i.e., that its presence changes all the other tones up to a certain point; with blue the red wavers, yellow turns greenish, the intermediate tones turn grayish or are discordant. Gold alone by its metallic reflections can reestablish harmony between the tones, when blue appears on a great area. Gold has that singular quality, although it gives a scale of yellow tones, not to be turned green by blue and not to change its gleam. It takes in its shadows warm tones, that take the place of the brownish red, that we interposed above between yellow ochre and blue; in the half tints it acquires greenish reflections that have a strong value and make blue azure. In the lights it sparkles and assumes a splendor that can be changed by no tone, however brilliant it may be. Gold thus becomes like a theme dominating the harmony, a theme sufficiently powerful to maintain harmony between tones however they clash. It prevents the radiation of blue, and it makes it so azure, that it is necessary to tinge it green so that it may not appear violet; it lightens red (vermilion) by the extraordinary warmth of its shadows; it gives to greens a splendor that they could not have beside blue surfaces; it warms purples by its greenish half tints. Then it is not a vulgar desire to give richness to a painted decoration, that caused the use of gold in such great quantity during the 13 th century, but the need of harmony imposed by the use of blue on large areas, and the use of blue on large surfaces is required by colored glass.





This question merits examination. In the 12 th century, as we have seen, men had adopted a simple and clear decorative harmony, composed of white, yellow tones, brownish red, greenish, slaty gray and grayish black. When they came to place very vividly colored glass, and the light illuminating the interiors was decomposed by the interposition of this glass, they soon perceived that these light tones became heavier and assumed a doubtful aspect; the black lines were multiplied to restore brightness to these paintings; but the black itself became grayish under the radiation from the colored glass. Blue touches were applied, but it was difficult to harmonize these with the yellow ochres, and those blues formed spots on small surfaces. Then the bold method was adopted, and they dared to cover the vaults entirely with blue, not a pale blue like certain decorations of the Romanesque epoch, but a pure blue, vivid and brilliant. Only one experiment of that kind was necessary to show that this boldness must modify the entire system of decorative painting. At first the blue vaults illuminated by the decomposed light of the glass assumed such an azure appearance, that they appeared almost violet, with a heavy tone that nothing could support. On those blue vaults was tried, as a corrective and to restore to the blue its real value, the placing of red touches, but the wavering of the red on the blue only made that color more azure. They tried white stars, but the white stars seemed gray; then finally were applied gold stars. Immediately the blue resumed its value, and instead of appearing to crush the interior, it raised it and acquired transparency. Either those touches of gold caught the light, or when they remained in the shadow; in the first case their yellow gleam, brilliant and metallic, softened the blue tone; in the second their value of very warm yellowish brown made it bluer. Thus one could modify this blue tone without inconvenience, and it was made slightly greenish to remove all appearance of violet. But this starting point, so intense, brilliant and powerful, must change the entire scale of tones accepted until then. To sustain blue vaults enriched by gold spots, no color was too brilliant or too intense, and it was necessary to admit vermilion, even vermilion glazed with lake, brilliant greens, transparent purples, and in the midst of all

to form gold as a harmonic element, or rather, the gold is  
 the result of the combination of the two elements, the gold is  
 glass colored and tilted limiting element, which network  
 and glass best work. This composed the coloring of the gold.  
 The coloring of the gold. To sort of decoration is more appro-  
 priate than painting. If you place a tone, it is necessary to  
 place all the elements to preserve the accord; the first layer  
 of color that you place on one side is a sort of engagement  
 with the other side, and the other side must be correspondingly  
 all the end, under penalty of producing only a resultive dis-  
 cord. For a long time we have not out of the difficulty with  
 color; when the harmony cannot be entered, when it has not been  
 established, they have said. But gold (golden expression)  
 is a color, and not a tone; in expressing it everywhere, al-  
 ways on all occasions, because it is only a confession of weak-  
 ness. There are paintings of very rich appearance without the  
 addition of gold in the least particles. Gold is almost com-  
 mon as a complement of blue; but one can produce a very bril-  
 liant effect without blue, and consequently without gold. The  
 addition of gold is not necessary, but it is a very good  
 of blue or gold, and vivid, ray and harmonious, warm and rich.  
 Those of the richness of the commandery of the temple at Me-  
 have a beautiful solution, and which gold and blue are to-  
 gether. The painting dates from the first half of the 15th  
 century; it is decorated with a gold and blue, with  
 a lot of colors supporting a ceiling of gold and blue (fig. 14).  
 In the column is placed a circle that receives the  
 floor beneath the altar, below and the surfaces of the wall  
 are entirely covered by gold and blue. At the entrance the gold  
 line of the walls, whose ground is changed in favor of blue  
 and blue. The entire organization consists only white for the  
 ground, yellow (gold) and red (coral). Between the beam a  
 is a design representing animals in a red and blue and blue  
 and from a white ground. Below is a frieze with white ground  
 and a light brown red ground, with outlines of blue  
 brown red. Then opposite each column of canopy is a frieze  
 with a frieze in brown red with a frieze. Between the can-  
 oles the frieze is composed of brown red and blue on a  
 white. The case consists of white dentils of brown red  
 with intervals of yellow coral and foliage of light brown



to throw gold as a harmonic element, prominent and dominating all. Men even went so far as to use grounds of enamel or of glass colored and gilded imitating enamel, gilded networks and glass bead work. This comprised the coloring of the S. Ch Chapelle of the palace. No sort of decoration is more attractive than painting. If you place a tone, it is necessary to place all the others to preserve the accord; the first layer of color that you place on one part is a sort of engagement that you impose on yourself, which must be rigorously kept till the end, under penalty of producing only a repulsive dab. For a long time men have got out of the difficulty with gold; when the harmony cannot be endured, when it has not been calculated, they lavish gold. But gold (pardon the expression) is a spice, and not a food; in scattering it everywhere, always on all occasions, perhaps it is only a confession of weakness. There are paintings of very rich appearance without the admission of gold in the least particle. Gold is almost compulsory as a complement of blue; but one can produce a very brilliant effect without blue, and consequently without gold. The paintings of the keep of Coucy, into which enters not a bit of blue or gold, are vivid, gay and harmonious, warm and rich. Those of the refectory of the commandery of the temple at Metz,<sup>1</sup> have a marvellous splendor, and neither gold nor blue are found there. That painting dates from the first half of the 13th century; it decorates a hall composed of two naves, with a row of columns supporting a ceiling of carpentry (Fig. 24, plan 7). On the columns is placed a girder that receives the floor beams. The girder, beams and the surfaces of the wall are entirely covered by paintings. At B we indicate the painting of the walls, whose ground is changed in design in each bay. The entire ornamentation comprises only white for the ground, yellow (ochre) and red (ochre). Between the beams a is a design representing animals in strong brownish red detached from a white ground. Below is a frieze b with white ornament on a light brownish red ground, with outlines of dark brownish red. Then opposite each column of canopy c is likewise traced in brownish red with a figured d. Between the canopies the grounds e are composed of brownish red diaper on white. The base f consists of wide dentils of brownish red with intervals g in yellow ochre and foliage of light brown-

brownish red enriched by black lines. The outside of the  
 paper gives the design a composed of wavy lines of brownish  
 red on white and wide yellow borders. The design is all  
 red; some represent white and blue on grey ground with brown  
 red and white; others have cavities alternately white, red  
 and yellow, separated by black lines. On the sides of the dis-  
 c are brownish lines, painted and outlined in  
 brownish red on a white ground with roses also red. The en-  
 tire decoration of this wall then consists of but two tones,  
 yellow and red, and red on a white ground with some blue  
 grey borders. By the aid of such simple means, the artist has  
 never been content with a very brilliant effect, very vivid and in  
 certain harmony. The more natural blue and red appear in the  
 ceiling.

Note 1. p. 24. Today this refectory is occupied within the  
 works of the school of Metz; it serves as a storehouse for

One will observe that the artist representing architectural  
 members, like the canopy of the altar, do not pretend to  
 realize a decoration in relief. This painted architectural is  
 purely conventional; it is a perspective. Men did not think  
 of making an illusion, and more than good archi-  
 tect. This fashion of architectural certain architectural fo-  
 rms exists some suggestion, as it is an important part of this  
 art. It is necessary to reproduce accurately the relative  
 dimensions, the modeling and the actual appearance of relief,  
 of moldings and ornaments, but to represent these forms and  
 to cause them to enter into the domain of painting. In fact,  
 for example, if one pretends to model an arch in stone by  
 means, painting can produce some illusion as one  
 could, it is certain that in looking at a wall covered  
 with, not only is the illusion impossible, one cannot achieve  
 that have no projections, those moldings and profiles that  
 do not submit to the laws of perspective, produce the most  
 disagreeable effect. The illusion in this case is a purely  
 abstraction that the artist gives himself, considering the  
 object that he wishes to render from one point; it does not  
 form a decorative painting, but only a trick of skill. Real-  
 istic sculpture and the artist has never understood that illu-  
 sion of decorative painting. If the painters of the 13th cen-



brownish red enriched by black lines. The underside of the girder gives the design composed of wavy lines of brownish red on white and wide yellow borders. The beams are all varied; some represent white and vair on gray ground with brownish red bands; others have chevrons alternately white, red and yellow, separated by black lines. On the sides of the girder are presented knights charging, painted and outlined in brownish red on a white ground with rosettes also red. The entire decoration of this hall then consists of but two tones, yellow ochre and red ochre on a white ground with some rare gray touches. By the aid of such simple means, the artist however has obtained a very brilliant effect, very vivid and in perfect harmony. But here neither blue nor gold appear in the painting.

Note 1.p.94. Today this refectory is comprised within the works of the citadel of Metz; it serves as a storehouse for forage.

One will observe that the parts representing architectural members, like the canopy c, for example, do not pretend to imitate a decoration in relief. This painted architecture is purely conventional; it is a hieroglyph. Men did not think then of making an illusion, any more than during good antiquity. This fashion of interpreting certain architectural forms merits some attention, as it is an important part of this art. It is unnecessary to reproduce accurately the relative dimensions, the modeling and the actual appearance of relief, of mouldings and capitals, but to interpret these forms and to cause them to enter into the domain of painting. In fact, for example, if one pretends to model an arcade in stone by tones, admitting that he can produce some illusions at one point, it is certain that in looking obliquely at this deception, not only is the illusion impossible, but those surfaces that have no projections, those mouldings and profiles that do not submit to the laws of perspective, produce the most disagreeable effect. The deception in this case is a puerile satisfaction that the painter gives himself, considering the object that he wishes to render from one point; it does not form a decorative painting, but only a trick of skill. Beautiful antiquity and the middle ages never understood that fashion of decorative painting. If the painters of the 13th cen-

century designed to decorate a space, and in this manner (Fig. 12). By the aid of this color of  
 yellow color and of design in brownish red on a white ground,  
 they obtained a very rich decoration, very easy to execute,  
 not expensive, and that in reality produced an effect more  
 decorative than could be done by a painting in oil.  
 Here the wallpaper within the grooves, the suspended factors,  
 as well as the band 3 are laid in yellow color; all the rest  
 of the grooves as well as the outlines of the borders of the  
 factors, the elements of the wallpaper, are in brownish red;  
 the ground is milky white. Such simple procedures, that can be  
 carried out by the most ordinary person, without the assistance  
 of any special artists, as well as to on  
 canvas and simple walls. Assume the ground of this grooves  
 to be in yellow color, and the rest in brownish red, and  
 the result will be a decoration of yellow color, and  
 however will present no difficulty in execution. In the process  
 as in the previous example, we shall have an equal amount  
 of red; in fact there is more than painted marbles, and  
 the coarse and baroque appearance of richness that is charac-  
 teristic of decorative painting, by substituting and indeed  
 never speaking to achieve the appearance as to the actual  
 value of the object decorated. We have retained some remains  
 of those good traditions in our wall paper. This may well  
 be considered the same work as that of Mr.  
 The have already seen that a newly colored glass has imposed  
 a great variety and a great intensity of tones in mural paint-  
 ings, as well as the aspect of gold. For reasons of economy  
 do not always permit the complete adoption of this combination  
 necessary, and can only be obtained with extensive resources.  
 It is interesting to see how the artists have got out of the  
 difficulty in such cases by rather employing gold not com-  
 pletely blue, and limiting themselves to a single narrow, a  
 narrow band of yellow, white, blue, and green.  
 medallions, like grey and green.



century desired to decorate a substructure, that the architect had not actually produced, they interpreted the architectural forms in this manner (Fig. 15).<sup>1</sup> By the aid of flat coats of yellow ochre and of designs in brownish red on a white ground, they obtained a very rich decoration, very easy to execute, not expensive, and that in reality produced an effect much more decorative than could be done by a painting in illusion. Here the tympanums within the arches, the suspended fabrics, as well as the band J are laid in yellow ochre; all the rest of the arcade as well as the outlines of the borders of the fabrics, the ornaments of the tympanums, are in brownish red; the ground is milky white. Such simple procedures, that can be employed by the most ordinary workmen, explain why painting was also applied indeed to modest edifices, as well as to chapels and sumptuous halls. Assume the ground of this arcade to be an intense blue on light green with damascening in gold, and we shall have a substructure of extreme richness, that however will present no difficulty in execution. In the modest as in the sumptuous painting, we shall have an equal amount of art; in truth that is worth more than painted marbles, and the coarse and barbaric appearance of richness that is generally sought in decorative painting, by endeavoring and indeed never succeeding to deceive the spectator as to the actual value of the object decorated. We have retained some remains of those good traditions in our wall papers. Thus they sell throughout the entire world as works of art.

Note 1.p.96. Traces of a painted arcade, abbey of Fontfroide.

We have already seen that strongly colored glass has imposed a great variety and a great intensity of tones in mural painting, as well as the support of gold. But reasons of economy do not always permit the resolute adoption of this complicated harmony, that can only be obtained with extensive resources. It is interesting to see how the artists have got out of the difficulty in such cases by neither employing gold nor consequently blue, and limiting themselves to a simple harmony, that comprises only red, yellow, white, black and some intermediates, like gray and green.

The choir of the church S. Nazaire of Carcassonne, the old cathedral, is an actual lantern filled with glass of incompar-

translucent coloring of the glass, and through the very small, being this color, but probably the resources were very small, and they aimed at economy. The glass is not able to use both, the a simple harmonic, and here is now they discovered. The glass looking the entire surface of the walls, there remains for examining only the process of the architecture, the ones and the values. The it gives the horizontal projection of the value, the angle A was removed for drawing there one and only; Contrast in his story; all the other triangles have been divided as the process of color. In the four half triangles a were from figures of angles in white grounds with red lines. As for the other grounds of the values, they have been altered by color with white and with red color, as indicated by the frame, the letter B marking the white grounds and the red grounds. It will be seen that this was done. To summarize the value of these tones placed under the values, not only have these been increased by the white and color, but they have been bordered by ornaments in very vivid tones and very delicate. The cross have been also covered by delicate and very vivid colors. Here (Fig. 17) is a detail of the detail of the value connected by contrast. The entire resources, as shown in a simple tone surrounding color, with a feeling of light green; and also alone is of color; as the second and a colored ground are indicated as blue. It is the only blue color of the entire value. The ground of color is vivid red, and the animals are in contrast, as well as the outer walls. The ground of the second is brown red. The two areas and the two animals are in contrast with yellow white. As for the ground B of the outer great angles, it is white with red lines, as we have seen. These are placed in yellow, with lines in contrast. The it gives the details of the details of these values. At A is the transverse area, placed at A in Fig. 17. The lines are drawn with angles almost entirely vertical and brown red bordered with broad black lines, with half areas of yellow color. The color is brown red. The road is ornamented by a tone alternately black, yellow color and brown red, each tone being separated by a white line. The color is brown red. The second filled is cov-



incomparable brilliancy and richness of tone. To sustain the translucent coloring of this glass, men thought that they must paint this choir, but probably the resources were very small, and they aimed at economy. Not being able to use gold, the painters have not adopted blue; they contented themselves with a simple harmony, and here is how they proceeded. The glass forming the entire surface of the walls, there remained for painting only the arcade of the substructure, the piers and the vaults. Fig. 16 giving the horizontal projection of that vault, the angle A was reserved for drawing there one subject; Christ in his glory; all the other triangles have been divided at the bosses by bands b. In the four half triangles c were drawn figures of angels on white grounds with red stars. As for the other grounds of the vaults, they have been alternately coated with white and with red ochre, as indicated by the drawing, the letter B marking the white grounds and R the red grounds. It will be agreed that this was bold. To sustain the value of those tones placed under the vaults, not only have these been intersected by the bands and bosses, but they have been bordered by ornaments in very vivid tones and very detailed. The ribs have been also covered by delicate and very vivacious ornaments. Here (Fig. 17) is a detail of the part of the vault occupied by Christ. The divine personage is clothed in a purple robe approaching violet, with a facing of light green; his halo alone is of gold; so the second halo painted behind his shoulders is blue. It is the only blue touch of the entire vault. The ground of Christ is vivid red, the animals are in grisaille, as well as the outer halo. The ground of the seraphim is brownish red. The two angels and the two seraphim are in grisaille with yellow wings. As for the ground F of the other great angles, it is white with red stars, as we have stated. These are clothed in yellow, with wings in grisaille. Fig. 18 gives the details of the painting of these vaults. At A is the transverse arch, traced at A' in Fig. 17. The fillet b is painted with squares alternately vermilion and brownish red bordered with broad black lines, with half squares of yellow ochre. The hollow c is brownish red. The round d is ornamented by a rope alternately black, yellow ochre and brownish red, each tone being separated by a white line. The hollow d' is brownish red. The second fillet is cov-





covered by little quatrefoils of yellow ochre and brownish red bordered by a white line, with black ground. The hollow is brownish red. The second round has on its upper part vermilion squares bordered by white lines, the ground is yellow ochre; the hollow below it is yellow ochre. The fillet n is decorated by quatrefoils alternately brownish red and yellow ochre on a black ground bordered by white lines.

The diagonal ribs B have their fillet it like the fillet e. The hollow k is brownish red and the round l is spirally decorated like the round d. The hollow m has little squares of salty gray on a ground of yellow ochre with a lower white fillet. The extreme round n is covered by vermilion quatrefoils on a black ground with white fillets. The extreme fillet o is also white. At C we give one of the borders laid on the vaults beside the diagonal ribs; those borders are all nearly similar. The ground of the design is vivid brownish red; the quatrefoils are vermilion with blackish blue squares, they are outlined by a black line and a white border; the intermediate squares are yellow ochre and the little scroll is white. A broad white line borders these bands; it is doubled by another light brownish red band with slaty gray squares and black lines. One of the stars is sketched at p. These stars, which are red on the white grounds of the vaults, are white on the brownish red grounds. At D we give one of the bands from the bosses of the vaults; their coloring consists of a white ornament slightly modeled with red lines on a vermilion ground; a wide brownish red band divides them in the middle lengthwise; white bands stop the vermilion grounds and are externally bordered by black bands. Those vaults being supported by clusters and delicate little columns, these are simply colored with alternate yellow and red tones with hollows black or red with black squares and white lines; the capitals have their leaves painted in yellow ochre on a dark brown ground. At the entrance of the choir, half columns G of very large diameters (1.3 ft.) are decorated by paintings, whose developed detail we give at G'. These are squares with four lobes alternately greenish blue and yellow ochre, on the grounds of which dark yellow ornaments are detached on a greenish blue ground, white on yellow. The intervals t are yellow ochre with white ornaments, a fragment of which we sketch at a larger scale at S. The lo-





lobed squares are outlined by a reddish brown line and a white band. The external fillets of the half column are white, brownish red and yellow ochre. Below the windows extends a very rich arcade <sup>1</sup> painted with heraldic shields on green grounds. Mitres surmount the shields. The rounds are ornamented by white, black and red squares. White and red lines border the grounds. In spite of the brilliancy of the glass, this coloring sustains itself and harmonizes perfectly with the translucent tones. These vaults with alternate white and red triangles, with their bands of brilliant tone from the bosses and their rich borders, have a very warm and solid effect. The architectural members are strongly detached by the very fine details in which black plays an important part, and are well distinguished from the compartments, while appearing light. These paintings date from the beginning of the 14 th century, like the construction itself.

Note 1.p.101. See Art. Construction, Fig. 111, that gives a section of the entrance to this choir.

It was necessary to take a bold method, when one assumed to decorate the so-called Gothic architecture by paintings. It was necessary for this painting to allow to dominate entirely the splendor of the colored glass, or it must sustain and participate in that brilliancy; it was particularly important that the structural forms, that have such great importance after the 13 th century in edifices, should be clearly accented by the system of painting. If one adopted blue vaults with gold stars, for example, it was necessary for the ribs of the vaults to be brilliantly colored sufficiently to support those grounds in strong tones, and to refer them to a different plane, so to speak. Gold was a great aid on these occasions, as well as black outlining the vivid tones, like vermilion and green. The painting of ribs and vaults thus treated, it required to support this, tones not less vivid on the clusters forming the piers, since the radiation of the colors of the glass tended to weaken the coloring of those piers, often very slender. Then only by hollows of a very warm and dark tone, like brownish red glazed with lake, very strong purple or blackish brown, that one could overcome the graying effect distributed by radiation from the glass over those adjoining surfaces. It was necessary to give to certain colors, like ve

vegetation, all these difficulties and so soon that with colorless  
the colors of the little colored patches of vegetation were  
last colors of light blue always obtained with black; on the  
the little colored patches of light blue, patches of vivid purple;  
on that surface of light blue, patches of rose purple. It is  
also interesting, that gold leaf is applied to these colors  
of colors favored by the richness of the colors of the  
patches of light green, patches of light blue, patches of  
the less favored by the blue and green and green, could not  
use color and lighter colors, and even the groups of light  
colors passed before them, defined in vision and brilliancy.  
This system was perfectly understood in the coloring of the  
panels of the palace. I looked in the system of colors for  
lighter, all supposed colors that from the skeleton and from  
of the colors, the colors with vision and brilliancy. On a  
one color, the colors are not and are kept in the second  
color.

Note 1.9.10. When the restoration of the paintings of the  
the colors was completed, there had not been discovered the  
system of coloring of the ground of the colors below the  
the colors were not, all on a dark color, but the  
general theory was changed by that and these dark colors.  
In the colors of the colors one of the colors was found a  
color of the light colors, that forms the ground of  
the colors of the colors, the colors of the colors.

In the restoration of the colors of the colors, the colors  
the colors of the colors were colored colors for an  
the colors. If these colors had colors, for example as  
the colors of the colors, there were colored by  
the colors very strongly colored by a different in colors.  
The colors were black and white, like that colored as a  
in the colors, colored black and white, like that colored  
that at the colors, colored by the colors of the  
the colors light colored colors colored colors, colored  
the colors and the colors as colors and the colors  
the colors, and the colors colors by the colors from  
the colors. If the colors, like that colored as a  
the colors of the colors of the colors, colored by



vermilion, all their brilliancy and to spot them with contrasted touches. Thus on the little column colored vermilion were laid touches of light blue always outlined with black; or on the little column colored light blue, touches of vivid purple; on that coating of intense blue, touches of rose purple. It is also understood, that gold lent its splendor to those groups of columns devoured by the nearness of translucent colors, when blue entered as a great part of the general harmony. The arcades or diaper ornaments arranged beneath the windows, being less devoured by the glass and nearer the eye, could resume softer and lighter tones, and then the groups of little columns passed before them, detached in vigor and brilliancy. This system was perfectly understood in the painting of the S. Chapelle of the palace.<sup>1</sup> Indeed in the system adopted for that interior, all supporting parts that form the skeleton and ribs of the edifice, are detached with vigor and brilliancy. On the contrary, the grounds are soft and are kept in the second plane.

Note 1.p.102. When the restoration of the paintings of the S. Chapelle was commenced, there had not been discovered the system of coloring of the ground of the arcades below the windows. Numerous trials were made, all on a dark scale, but the general harmony was deranged by that and these dark grounds. In washing a wall near the entrance one day was found a fragment of the light diaper ornament, that formed the ground of this arcade; being immediately reproduced, the general harmony was reestablished.

To restrict the radiation of the colored glass, the decorative painters of the middle ages employed certain means for an assured effect. If these windows had splays, for example at the beginning of the 13 th century, these were decorated by ornaments very strongly accented by the difference in tones. These designs were black and white, like that presented at A in Fig. 19, or reddish brown, black and white, like that sketched at B. Those strong colors, weakened by the effect of the decomposed light passing through the colored glass, retained sufficient vigor and distinctness to border the translucent paintings, and assumed harmonious tones by the radiation from those paintings. If the windows, like most of those seen in the edifices of the middle of the 13 th century, consisted of

columns forming slight groups of light





mullions forming slight groups of little columns, those were covered by tones very near black, such as dark brownish red, very intense greenish blue, dark slate, or brownish purple. Those obscure lines formed a frame for the glass; yet the colored glass being always bordered by a narrow band of white glass as a margin, and to prevent the wavering of the translucent tones against the architecture, along that white band was painted a vermilion line to better accent the brilliancy of the luminous line. (Art. Vitrail).

Independently of the coloring and of the harmonic system of decorative painting, the artists of the 12<sup>th</sup> and 13<sup>th</sup> centuries notably gave to the designs of painted ornaments forms suited to the place occupied in the architecture. Indeed the design of an ornament applied on a surface sensibly modified that, as we briefly indicated in Fig. 6. The bands are covered by ornaments running horizontally. The piers and columns, the vertical surfaces, that support and therefore must appear rigid, have their surfaces occupied by ascending ornaments.

Here are some examples (Fig. 20) of ornaments borrowed from paintings covering columns of the 12<sup>th</sup> and 13<sup>th</sup> centuries. Example A comes from the columns of the apsidal chapels of S. Denis. It presents a spiral of light green on a ground of whitish yellow, bordered by a brownish red stripe, with white dots set on the red and green.<sup>1</sup> Examples B come from columns of the church of Romans. That at B gives a lattice of red leaves on a greenish blue ground; B a has greenish blue lozenges with brownish red designs on a white ground; B b has dark brown and green vairs on white; B c has green and red chevrons on a white ground, with an interposed brown stripe. Design C was drawn on the shaft of a column of the church of S. George of Boscherville, and has chevrons of red lake and vivid green on white ground, with an interposed stripe of vivid brownish red.<sup>1</sup> Example D was very common in the 13<sup>th</sup> century, and gives the columns delicacy and rigidity. The breaks in the vertical lines have the advantage of making felt the cylindrical surface of the column, always destroyed by flutes, especially if these columns are slender. This need of conforming the painted ornament to the construction, and for even strengthening that by the kind of painting, caused the adoption of those jointings so common in especially the colored decoration of the 12<sup>th</sup> and 13<sup>th</sup> centuries. Those jointings are very simple





or rich is shown by Fig. 21, white on a yellow ochre ground, or more frequently brownish red on a white or pale yellow ground; the lines thus traced with the brush on large surfaces, single, double or triple, or accompanied by certain ornaments, present very economical decoration, perfectly accenting the bands, groups of columns, and borders covered by a more complex ornamentation and with brilliant colors.

Note 1.p.103. These ornaments of columns are shown developed.

Note 1.p.104. These examples of columns belong to the 12 th century.

In interiors, when the walls and piers are painted, sculpture is naturally covered by colors; for it is to be noted that the artists of the middle ages, like those of antiquity, did not admit partial coloring; indeed they either did not paint interiors, or they entirely painted them. If they had small resources at command, this painting was merely whitewash on a great part of the surface; but they thought that the painting called for painting, and that a colored band could not be placed alone on a wall retaining its stone color. That is a very proper feeling for harmony. If there be sometimes exceptions to this rule, this is when the painting is only regarded as an outlining of the form. For example, certain sculptures of capitals and reliefs are seen, whose ornaments and figures are outlined in black or brownish red; certain hollows of ribs or of groups of little columns are filled with a brown tone to trace the form; but that is no longer painting but drawing, a means of accenting forms, that one desires to make better seen. Also sometimes, as for example in the vaults of the choir of the cathedral of Meaux, men had the idea of distinguishing the voussours of diagonal or transverse arches by means of two different tones. These are exceptions. In Art. Statuaire, we shall speak of the mode of coloring images and statues, for the artists of the middle ages have most frequently admitted, like the Greeks of antiquity, that statues should be colored. As for the ornamental sculpture of interiors, kept in light tones on dark grounds during the Romanesque epoch of the 12 th century, light green or yellow ochre on grounds of brown, purple or even black, it is colored more strongly during the 13 th century, and particularly during the 14 th, in order to detach it vigorously from the simple parts, according

to the surface of the material. If the surface is not smooth, the color will be affected. The color of the material is also affected by the way it is used. If it is used in a dry place, the color will be different from when it is used in a wet place. The color of the material is also affected by the way it is stored. If it is stored in a dark place, the color will be different from when it is stored in a light place. The color of the material is also affected by the way it is handled. If it is handled roughly, the color will be different from when it is handled carefully. The color of the material is also affected by the way it is cleaned. If it is cleaned with a harsh detergent, the color will be different from when it is cleaned with a mild detergent. The color of the material is also affected by the way it is dyed. If it is dyed with a harsh dye, the color will be different from when it is dyed with a mild dye. The color of the material is also affected by the way it is finished. If it is finished with a harsh finish, the color will be different from when it is finished with a mild finish. The color of the material is also affected by the way it is used. If it is used in a dry place, the color will be different from when it is used in a wet place. The color of the material is also affected by the way it is stored. If it is stored in a dark place, the color will be different from when it is stored in a light place. The color of the material is also affected by the way it is handled. If it is handled roughly, the color will be different from when it is handled carefully. The color of the material is also affected by the way it is cleaned. If it is cleaned with a harsh detergent, the color will be different from when it is cleaned with a mild detergent. The color of the material is also affected by the way it is dyed. If it is dyed with a harsh dye, the color will be different from when it is dyed with a mild dye. The color of the material is also affected by the way it is finished. If it is finished with a harsh finish, the color will be different from when it is finished with a mild finish.

Let us close this survey of printed decoration of interiors by a general remark on the average adopted by the artists of the middle ages. Everyone has seen Persian rugs, Indian shawls, and all are struck by the soft and substantial splendor of those fabrics and their incomparable harmony. Well, let us examine the processes of coloring adopted by those artists and we shall see that of an artist that are chosen, and that the value of each one results from the juxtaposition of another tone. Unusual as Indian shawls and Persian rugs are, and yet will be surprised by the little brilliancy of each one taken separately. Not one of those bills of wool, that does not appear dull in comparison with our dyes, and yet when they are passed through the loom or the thimble and have become fabrics, they excel all our fabrics in harmonic value. Now what is the reason for this? It is the relation of the colors to each other, in their proper juxtaposition, because of their relative brilliancy, and especially in the relative importance given to broken tones. There is no necessity for obtaining a coloring with brilliant appearance, to maintain pure colors and to make them seem more so, but to give a special value to a color by better surroundings. A color



to the systems that we have mentioned above. If gold appeared in the decoration, the foliage of the capitals is gilded entirely or in part on grounds of purple, blue or vermillion. If gold is excluded, the ornaments are covered by yellow or vivid green tones on very vigorous grounds, and the yellow is outlined by black lines like gold; for gilding is never laid without being accompanied by depths and red undercoats, with black outlines, so as to clear and illuminate the forms of the sculpture. Those black lines are brilliant, being laid with a material like our varnish, and always have a brown gleam. In this way the gilding assumes a brilliancy and marvelous relief, it is never soft or undecided. If the gilding be placed on large surfaces, as on grounds or as draperies of statues, network and glazing give a precious and light effect to its gleam; thus one prevents those reflections, so crushing for the adjacent coloring, too broad lights and too uniformly brilliant.

Let us close this survey of painted decoration of interiors by a general remark on the system adopted by the artists of the middle ages. Everyone has seen Persian rugs, Indian shawls, and all are struck by the soft and substantial splendor of those fabrics and their incomparable harmony. Well! Let one examine the procedure of coloring adopted by those oriental weavers. The procedure is at bottom very simple. Setting aside the choice of tones, that is always soft and delicate, we shall see that often tones eight are broken, and that the value of each one results from the juxtaposition of another tone. Unravel an Indian shawl and separate the tones, and you will be surprised by the little brilliancy of each one taken separately. Not one of those balls of wool, that does not appear dull in comparison with our dyes, and yet when they have passed through the loom of the Thibetan and have become fabrics, they excel all our fabrics in harmonic value. Now that quality consists solely in the knowledge of the relation of tones, in their proper distribution, because of their influence on each other, and particularly in the relative importance given to broken tones. Indeed it is not necessary for obtaining a painting with brilliant appearance, to multiply pure colors and to make them scream beside each other, but to give a special value to a point by neutral surroundings. A square

of the... will acquire value and beauty, so that as the years pass this a  
 soon will appear blue and transparent. But this is not the  
 times, and it will not only see all and possibly, but it  
 will see the blue and transparent in the same way.  
 there is a... but our decorators have been during the  
 while they, as shown in the painting of their moment, a  
 their virtues of manhood and stained glass; for the  
 have, already famous in monumental coloring, are done  
 more typical already in the translucent coloring of glass,  
 where every touch of color seems to be in its place.

The processes employed by artists for decorating interiors  
 were already very perfect in the 13th century, as can be seen  
 not in the... of certain frescoes of the same epoch. Then various and  
 oil painting were in use. In the 14th century it even appears  
 that fresco was more of the last process in France. It  
 sly and German. V. Fugère said in his history of painting  
 that in painting, fresco, and in an evident manner,  
 that from the 11th century, the artists used colors from  
 their own finest oil, and the list of painting extended by  
 order of the Duke of Normandy (later Charles V) in the castle  
 of Valerail in 1357 by Jean Goussier, proves that the process  
 of painting in oil was then known in France, and was practi-  
 ed not only for furniture and small works, but also for the  
 decoration on the walls. This list begins thus:--

1. p. 107. Among others, the fresco deposited in the south  
 side aisle of the choir of the Abbey church of Westminster.  
 (Work of the French school).
- Note 2. p. 107. See Goussier's account, already cited, and the  
 description of the painting made in 1504. I and III of the  
 second series of the *Album de l'École de Chartres*. p. 244, 245.
- Note 3. p. 107. *Album de l'École de Chartres*. p. 244, 245.

"First for the wall in the manner in which it is composed  
 or better: i.e., to complete the story of the life of Christ,  
 and after on the floor, with a list of names and legends, as  
 is common."



of 0.4 inch of turquoise blue on a large reddish brown surface will acquire value and delicacy, so that at ten paces this touch will appear blue and transparent. Enlarge this area five times, and it will not only seem dull and doubtful, but it will make the warm brown tone surrounding it heavy and cold. There is then a science there, an experimental science, it is true, but our decorators marvellously possessed during the middle ages, as proved in the painting of their monuments, their vignettes of manuscripts and stained glass; for those laws, already imperious in monumental coloring, are quite more tyrannical already in the translucent coloring of glass, where every touch of color assumes such great importance.

The procedures employed by painters for decorating interiors were already very perfect in the 13<sup>th</sup> century, as can be judged by examining the old paintings of the S. Chapelle and those of certain *rearedoses* of the same epoch.<sup>1</sup> Then varnish and oil painting were in use. In the 14<sup>th</sup> century it even appears that frequent use was made of the last process in France, Italy and Germany.<sup>2</sup> M. Emeric David in his *Discours historique sur la peinture moderne*,<sup>3</sup> demonstrates in an evident manner, that from the 11<sup>th</sup> century, the painters used colors ground with pure linseed oil, and the list of painting executed by order of the duke of Normandy (later Charles V) in the castle of Vaudreuil in 1355 by Jehan Coste, proves that the process of painting in oil was then known in France, and was practised not only for furniture and small works, but also for the decoration on the walls. This list begins thus:--

1.p.107. Among others, the *rearedos* deposited in the south side aisle of the choir of the abbey church of Westminster. (Work of the French school).

Note 2.p.107. See Gennino Gennini, already cited, and the description of the painting made in Vols. I and III of the second series of the *Bibl. de l'école de Chartres*. p. 544, 335.

Note 3.p.107. Paris. 1812. 8vo.

"First for the hall in the manner in which it is commenced or better; i.e., to complete the story of the life of Cesar, and below on the lowest band a list of beasts and images, just as commenced.

Item, the great chapel, to make the stories of Our Lady, of S. Anne, and of the Passion around the altar, as it can be made





made, etc.

And all those things described will be done with fine colors in oil, and the grounds of fine gold in relief, etc."

Glazing was frequently employed in decorative painting after the 13<sup>th</sup> century; the delicacy of these paintings, their solidity and brilliant appearance, indicate a procedure permitting all the refinements of modeling and coloring. With oil painting, the artists of the 14<sup>th</sup> and 15<sup>th</sup> centuries in France, also employed a painting into which enters as adhesive a very hard and very transparent resinous material, for example like gum copal. Perhaps the two elements, oil and resin, were employed together, gum copal then taking the place of a dryer. Analysis of some of these paintings indeed often shows a certain quantity of resin.

Decorative painting is not only applied to the surfaces of interiors, but it plays an important part on the exteriors of edifices. The facade of Notre Dame of Paris presents numerous traces of painting and gilding, not laid on the bare walls, but on mouldings, columns, ornamental sculptures and statuary. One can make the same observation on the cathedral of Amiens, and the ornaments placed at the tops of the great gables of the transepts of the cathedral of Paris, which date from 1257, were gilded with dark and black grounds.

The coloring applied on the exterior is much harder than that of the interior; these are tones of vivid red (vermilion glazed with a very brilliant purple tone), hard green tones, orange yellow ochre, pure blacks and whites, rarely blues. Indeed on the exterior the strong direct lights and shadows permit a hardness of coloring, that would not be supportable under the diffused and softened light of the interiors.

Statuary according to the antique method is outlined by blackish brown lines, that accent the lines of the head, and borders of the drapery, embroideries, and the folds of the garments. The ornaments are likewise very strongly outlined by these black lines, either on the grounds or on the edges. Sometimes under the projections of drips, bands or cornices, the rounds are covered by a red or green tone and are enhanced by white or yellow dots, that give a singular delicacy to the mouldings. We have become so timid in the matter of monumental painting, that we scarcely understand today that expression of





art. It is with painting applied to architecture as for a musical composition, that to be understood it must be heard several times. And if twenty years since, no person in Paris could understand a symphony of Beethoven, one could not blame Beethoven for it. Harmony is a language for the eyes as for the ears; one must familiarize himself with it to seize its sense. Some enlightened persons voluntarily admit that the interiors of edifices may well be decorated by paintings; but the idea of decorating the exteriors seems very strange, particularly if it be necessary to decorate them, by some tympanums under porches, but by the entirety of coloring, that extends over nearly the entire facade.

Yet the artists of the middle ages never had the idea of entirely covering with color a facade 230 ft. high by 164 ft. wide, like that of Notre Dame of Paris. But on those immense surfaces they adopted a system of decoration. Thus at Notre Dame of Paris the three portals with their voussours and tympanums were entirely painted and decorated; the four niches connecting those portals and containing four colossal statues were likewise painted. The gallery of kings alone formed a deep band entirely painted and gilded. The painting above that band was only attached to the two great arches with windows beneath the towers, and to the central rose window, which sparkled with gilding. The upper portion being lost in the atmosphere was left in the tone of the stone. Examining this facade, it is easy to render an account of the splendid effect, that must have been produced by this system so well in accord with the architectural composition. In that coloring black played an important part; it bordered the mouldings, filled the grounds, outlined the ornaments and accented the figures by broad lines placed with a true feeling for the form. Black intervenes there as a retouch of the master, to remove its coldness and dryness; it frequently merely doubled a wide brownish red line. The roofs were brilliant with colors, either by the combination of glazed tiles, or by painting and gilding applied on the lead. (Art. Plomberie). Sometimes even plates of glass were set in grounds on cement, interposing a leaf of tin or gold, adding touches of very vivid brightness in the midst of dull tones. Why do we deprive ourselves of all these resources supplied by art? When does the so-called classical

extremely vividly

After the 16th century was reached the original printing  
was completely destroyed. The original printing was  
the first of the 17th century and was printed in  
by the aid of a combination of brick and stone, sometimes  
on with special balance.

1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 26



school pretend that coldness and monotony are companions inseparable from beauty, when the Greeks, that are presented to us as preeminent artists, always colored their edifices inside as well as outside, not timidly, but with the aid of colors extremely vivid?

After the 16 th century was renounced the external painting of architecture, and gradually coloring disappeared; yet at the beginning of the 17 th century men sought colored effects by the aid of a combination of brick and stone, sometimes even with applied faience.

#### PENDENTIF. Pendentive.

A triangle of a hemispherical vault left between the penetrations into this vault by two round or pointed half cylinders. The earliest pendentives mentioned in the architecture of the middle ages in France are those supporting the domes of the abbey church of S. Front at Perigueux (Art. Coupole, Fig. 6). This system of construction has rarely been employed except in localities near that important monument. But by extension, the name of pendentive has been given to trumpets or corbellings placed in the angles formed by arches resting on a square plan, and intended to cause the construction to pass from the square to the octagonal or the circular plan.

Taking the term pendentive in the last sense, we shall have in many provinces of France domes and transept towers resting on pendentives. Thus for example, the central lantern of the church of Nantua would be borne on pendentives (Fig. 1). In fact the triangle A is only a corbelling whose horizontal section is straight and not curved, as must be every horizontal section of a pendentive. The courses composing this corbelling have horizontal beds and do not tend to the centre of a sphere, as the beds of a pendentive should do.

To restore the true meaning of the word pendentive, we present in Fig. 2 a sort of analysis of the system of construction to which it should be applied. Take a hemisphere whose horizontal projection is the dotted line A B C D. On each side of the square A B C D inscribed in the sphere, if we erect vertical planes, we form four sections A B a, B C B, C D c and D A d in the hemisphere, that give semicircles. Assume that we





turn four arches under these four semicircles, we shall then transfer the weight of the upper calotte of this sphere and the four triangles to the four points A B C D. Then admitting that above the crowns of these four arches we make a horizontal section in the hemisphere, we shall obtain a perfect circle a b c d. On this circle we erect a hemispherical vault a b c d e, and we shall have a dome borne on four actual pendentives. The beds of all voussoirs forming these pendentives, (that are only fragments of a primary dome) will radiate from the centre E, just as all beds of the voussoirs of the upper dome a b c d e will radiate from the centre g. Thus the entirety forms a homogeneous shell, whose weight tends to press the voussoirs of the interior and are entirely transferred to the four points A B C D. This system of vaulting, employed first in the great church of S. Sophia of Constantinople,<sup>1</sup> as we have stated, was applied to the construction of the church of S. Mark of Venice, then to that of the church of S. Front of Perigueux about the end of the 10 th century. Still the constructors of Perigord manifested timidity in the use of the means, that makes one credit their small confidence in the efficacy of this system, and especially their complete ignorance of the theory of the pendentive; while at S. Mark of Venice the domes and their pendentives are drawn and built according to the theoretical principle that governs this kind of structure. At S. Mark the generating curve of the pendentives of the dome is the complete semicircle; it is not the same at S. Front of Perigueux, and we shall see what were the singular consequences of the modification made by the French architects in the principle adopted at S. Mark. Fig. 3 gives at A the horizontal projection of one of the domes of S. Front. The four piers that support the transverse arches receiving the pendentives are at B. Perhaps frightened by the overhang that would form the four pendentives, if they were generated by a semicircle, the architect of S. Front had the idea of generating these pendentives by means of a pointed curve a b c (see section C). Hence erecting vertical planes f from the angles of the four piers to form the penetrations of the transverse arches in the generating form of the pendentives, he could not obtain semicircles, but an elliptical curve traced in e f g. The ellipse presenting difficulties in joint-

[illegible]

• (electro) acid

Note 1. p. 110. B. Sophie of Constantinople of last present

Note 1.9.113. Parthitecture Pyraline en France. 1951.  
the first known example of this kind of work.

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A word employed in architecture to designate the corner or intersection of two bodies or of two forms. Thus for example in Fig. 189 (Arch. Construction), the corners of the dome are the great wall or the circle of Corbel form perforations in the vaulted ceiling. In Romanesque architecture the corners are sometimes seen known as "cornices" in modern style. The term is also applied to the corners of the dome.



jointing, the architect cheated and replaced the elliptical curve by a pointed arch  $e f o'$ . A fact unheard of at that epoch, that all other arches are round. This architect, instead of erecting a dome vertically on the pendentives at  $h$ , caused it to recede to  $l$ , and thus gave it a less pointed curve  $l m$ , as shown by the section. So that the section made on the diagonal  $n o$  gives the trace  $D$ . It must be stated that these pendentives, instead of being constructed of voussoirs with beds radiating from the centre  $n$ , are formed of large blocks of rubble set horizontally and corbelled, as seen at  $p$ . The pendentives are then only a sham, not a principle of construction understood and applied. This fact alone seems to indicate that if the church of S. Front was erected in imitation of that of S. Mark, as perfectly demonstrated by M. Felix de Verneilh,<sup>1</sup> the construction was entrusted to some western architect, who not obtaining an accurate knowledge of the system of domes on pendentives (since these pendentives are after all only corbellings), and consequently sought to lessen their overhang by not erecting these domes vertically over the upper section of these pendentives. Later our western architects, better informed or wiser, erected actual domes on pendentives, as proved by the churches of Angoulême, Solignac, Cahors, Souillac, etc. Yet one will observe that the generating curve adopted for the pendentives of S. Front will remain sanctioned, for the transverse arches of those churches all give pointed curves, although in those provinces the round arch long continued in honor. (Arts. Architecture Religieuse, Construction, Coupole).

Note 1.p.110. S. Sophia of Constantinople at least presents the first known example of this kind of vault.

Note 1.p.113. L'Architecture Byzantine en France. 1851.

#### PENETRATION. Penetration.

A word employed in architecture to designate the points of intersection of two bodies or of two forms. Thus for example, in Fig. 139 (Art. Construction), the openings of the domes of the great hall of the castle of Corcy form penetrations in the ceiled vault. In Romanesque architecture are sometimes seen windows causing penetrations in masonry vaults. Some tunnel vaults of the Romanesque epoch also receive penetrations of

...as an example taken from the study of the ...  
...it is ...  
...of ...  
...and the advantages of ...  
...this ...  
...the ...  
...and been built in the first day of the ...  
...the ...  
...of ...

The name of ...  
...in the ...  
...are found at different ...

A piece of ...  
...the leaves of ...

A list of ...  
...the word "..." is ...  
...the ...  
...the ...  
...the ...  
...the ...  
...the ...

Note 1. p. 111. ...  
...of the 13th century.  
...the ...  
...the ...  
...the ...  
...the ...  
...the ...  
...the ...



vaults. Hence these cases are extremely rare. Here (Fig. 1) is an example taken from the abbey church of Pontgombaudo (12th century). It is surprising that having recognized the danger of tunnel vaults, that the architects of the 12th century did not more frequently employ the system of penetrations, which had the advantage of transferring these thrusts to certain points, more stable or abutted. In the church of Pontgombaudo, the arches of the vaults are round. This penetration alone, although of the same epoch, presents an appointed curve; it had been built in the first bay of the transept, to permit the opening of an exceptional upper window. One sees windows in penetration in the vault of the nave of the little church of Chateauneuf.

The name of penetration is also given to those vertical prismatic forms, that in the architecture of the 15th century, pass through bands and are found at different heights. (Art. Trait).

PENTURE. Hinge.

A piece of ironwork employe for hanging the leaves of doors. (Art. Serrurerie).

PERRON. A flight of external steps.

During the middle ages the word "perron" is commonly employed to designate the external steps that give admission to the principal hall of the castle or palace, in the place reserved for hearing or great assemblages.

In the *Chanson des Saxons*,<sup>1</sup> the barons brought to Charlemagne four deniers apiece. The emperor caused the sum to be laid in a heap. (Old French poem).<sup>2</sup>

Note 1.p.115. *Chanson des Saxons*, by Jean Bodel, a poet of Artois, of the 13th century.

Note 2.p.115. Chapter 45.

The great flight of steps is one of those traditions of the peoples of the North, whose origin runs very far back in the historical annals. It is the platform of the Scythians, the pile of stones on which sat the chief of the tribe; the emblem of the high place on which were, and from which descended the conquering and superior races. It would be interesting to investigate and collect the origins of the platform placed on a flight of steps, for that is one of the monuments that one f

finds on the surface of the globe, wherever a species has  
its habitat, it is the same in its habits and its  
life. The habits of the species are the same in all  
the groups under the same. The common habits of the species  
are the general to receive the attention of the zoologist.  
The habits of the species are the same in all the groups  
of species that are the same in the habits of the species.  
as on a sacred place. (Old French poem).

The habits of the species are the same in all the groups  
of species that are the same in the habits of the species.  
as on a sacred place. (Old French poem).  
The habits of the species are the same in all the groups  
of species that are the same in the habits of the species.  
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as on a sacred place. (Old French poem).  
The habits of the species are the same in all the groups  
of species that are the same in the habits of the species.  
as on a sacred place. (Old French poem).

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of species that are the same in the habits of the species.  
as on a sacred place. (Old French poem).



finds on the surface of the globe, wherever a superior race has established itself in the midst of conquered peoples. From the top of the flight of steps the Roman general addressed the troops under his orders. The campaign tribune on which sat the general to receive the submission of the vanquished, was only a pile of stones with a flight of steps.<sup>1</sup> On a flight of steps the author of the *Chanson de Roland* has his hero die, as on a sacred place. (Old French poem).<sup>2</sup>

Note 1.p.116. See the reliefs on the column of Trajan. (Latin quotation; De Bell Gall. Book VII. Surrender of Alesia).

Note 2.p.116. *Chanson de Roland*. Stanza 145.

In the romances of the 12 th and 13 th centuries is frequent mention of flights of steps at the top of which stand the lords to receive their vassals:-- (Old French poem).<sup>3</sup>

Note 3.p.116. *Œuvres l'Ardenois*. Verse 8517.

To the bottom of the flight of steps of the palace descend the personages that come to visit the superior; they are received there, if it is desired to do them honor. (Old French poem).<sup>4</sup>

Note 4.p.116. *Romans de Berte aus grans pies*. Chap. 9.

When William of Orange surrendered to the king of France after the fall of Orange, he arrived incognito. (Old French poem).<sup>5</sup>

Note 5.p.116. *Guillaume d'Orange, la bataille d'Alésans*, Verse 2568 et seq.

The steps of castles were accompanied by horse-blocks. (Art. Montoir):-- (Old French poem).<sup>6, 7.</sup>

Note 6.p.116. *Chanson des Saxons*. Chap. 22.

Note 7.p.116. *Le Lai of Lancel*; poems of Marie of France.

As we have already seen above, the flight of steps is sometimes a monument destined to perpetuate a victory. Such is that which Charlemagne caused to be erected at Tremoigne:-- (Old French poem).<sup>1</sup>

Note 1.p.117. *Chanson des Saxons*. Chap. 296.

The flight of steps was then a mark of nobility, a sign of power and of jurisdiction. The communes erected flights of steps before their city halls as a sign of their franchises; thus we see that when Charles, duke of Burgundy, had subjugated the territory of the city of Liege in 1467, to punish the citizens for their revolt, and to mark their humiliation:--

and of Louis XI, published by M. Le Roux (La Haye). 1857.

1857.

... of arms during the middle ages, and why these exten-  
sive shields were regarded as the visible mark of the power of  
the lord. Lord de Joinville relates that during the battle  
of Agincourt, he saw a wagon laden with three dead men being taken  
to the king. A cleric had killed these three men, who were a  
mercenary of the Countess, and had robbed them of their armor.  
The cleric was brought, and King Henry asked him how this had  
come to pass, and asked the provost of Paris how this had  
come to pass. The same cleric explained, and the king saying in-  
terestedly in a case of legitimate defense: -- "Sir cleric,"  
said the king after hearing the report, "you have lost becom-  
ing a priest by your prowess, and by your prowess I retain you  
in my service, and come with me over the sea. And for what you  
have done, I will reward you as you wish, but I will not  
execute them in any of their bad deeds."

Note 2. p. 117. *Memories of Lord de Joinville. Section 61.*

There then is a fragment rendered by the governor in the co-  
color air at the top of the flight of arms of his office.  
These flights of arms, even by the importance that they a-  
ssumed in the palace and castle, were usually painted, deco-  
rated by painters and by sculptured figures. Some horses, ac-  
cording to a custom that seems very old, even fastened with  
animals to the foot of the flight, as if to prevent separation.  
A tale in verse of the 13th century relates, that a certain  
castellan of the city of Rome, a wealthy and powerful man,  
had fastened a coat to the arms of his office. At the top of  
the flight of arms of the castle of Orsay, at the entrance of  
the city wall, was a lion passant guardant, which was  
four other lions.

Note 1. p. 118. *See often at the present. (See Legend & History).*

Note 2. p. 119. Some fragments of this monument still exist.

They have been deposited in the keep.

The small vertical fragments of the monument were

then deposited in the keep, and the fragments of the monument

arms during the middle ages. We shall now examine some of



(Old French poem).<sup>2</sup>

Note 2.p.117. Chants populaires of the time of Charles VII and of Louis XI, published by M. Le Roux (de Linzy). Aubry. 1857.

This passage explains all the importance attached to the flight of steps during the middle ages, and why these external steps were regarded as the visible mark of the power of the lord. Lord de Joinville relates that going to the palace one day, he met a wagon laden with three dead men being taken to the king. A cleric had killed these three men, who were sergeants of the Chatelet, and had robbed them of their clothing. Leaving his chapel, the king "went to the flight of steps to see the dead, and asked the provost of Paris how this had occurred." The case being explained, and the cleric having acted bravely in a case of legitimate defense:-- "Sir cleric," said the king after hearing the report, "you have lost becoming a priest by your prowess, and by your prowess I retain you in my service, and come with me over the sea. And for what you have done, I much desire that my men may see, that I will not sustain them in any of their bad deeds."<sup>3</sup>

Note 3.p.117. Memoires of Lord de Joinville. Section 64.

Here then is a judgment rendered by the sovereign in the open air at the top of the flight of steps of his palace.

These flights of steps, even by the importance that they assumed in the palaces and castles, were richly built, decorated by balustrades and by sculptured figures. Some lords, according to a custom that seems very old, even fastened wild animals to the foot of the flight, as if to prevent approach. A tale in verse of the 13th century relates,<sup>1</sup> that a certain castellan of the city of Rome, a wealthy and powerful man, had fastened a bear to the steps of his palace. At the top of the flight of steps of the castle of Coucy, at the entrance of the great hall, was a slab bearing a stone lion, supported by four other lions.<sup>2</sup>

Note 1.p.118. Le chien et le serpent. (See Legend d'Aussy).

Note 2.p.118. Some fragments of this monument still exist. They have been deposited in the keep.

We shall be pardoned the length of these quotations; they were necessary to explain the importance of the flights of steps during the middle ages. We shall now examine some of

[illegible][illegible]

It was only about the end of the last (1931) century, that the great first of seeds of the palace was destroyed, to be replaced by the existing (1931) building, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000, 1001, 1002, 1003, 1004, 1005, 1006, 1007, 1008, 1009, 1010, 1011, 1012, 1013, 1014, 1015, 1016, 1017, 1018, 1019, 1020, 1021, 1022, 1023, 1024, 1025, 1026, 1027, 1028, 1029, 1030, 1031, 1032, 1033, 1034, 1035, 1036, 1037, 1038, 1039, 1040, 1041, 1042, 1043, 1044, 1045, 1046, 1047, 1048, 1049, 1050, 1051, 1052, 1053, 1054, 1055, 1056, 1057, 1058, 1059, 1060, 1061, 1062, 1063, 1064, 1065, 1066, 1067, 1068, 1069, 1070, 1071, 1072, 1073, 1074, 1075, 1076, 1077, 1078, 1079, 1080, 1081, 1082, 1083, 1084, 1085, 1086, 1087, 1088, 1089, 1090, 1091, 1092, 1093, 1094, 1095, 1096, 1097, 1098, 1099, 1100, 1101, 1102, 1103, 1104, 1105, 1106, 1107, 1108, 1109, 1110, 1111, 1112, 1113, 1114, 1115, 1116, 1117, 1118, 1119, 1120, 1121, 1122, 1123, 1124, 1125, 1126, 1127, 1128, 1129, 1130, 1131, 1132, 1133, 1134, 1135, 1136, 1137, 1138, 1139, 1140, 1141, 1142, 1143, 1144, 1145, 1146, 1147, 1148, 1149, 1150, 1151, 1152, 1153, 1154, 1155, 1156, 1157, 1158, 1159, 1160, 1161, 1162, 1163, 1164, 1165, 1166, 1167, 1168, 1169, 1170, 1171, 1172, 1173, 1174, 1175, 1176, 1177, 1178, 1179, 1180, 1181, 1182, 1183, 1184, 1185, 1186, 1187, 1188, 1189, 1190, 1191, 1192, 1193, 1194, 1195, 1196, 1197, 1198, 1199, 1200, 1201, 1202, 1203, 1204, 1205, 1206, 1207, 1208, 1209, 1210, 1211, 1212, 1213, 1214, 1215, 1216, 1217, 1218, 1219, 1220, 1221, 1222, 1223, 1224, 1225, 1226, 1227, 1228, 1229, 1230, 1231, 1232, 1233, 1234, 1235, 1236, 1237, 1238, 1239, 1240, 1241, 1242, 1243, 1244, 1245, 1246, 1247, 1248, 1249, 1250, 1251, 1252, 1253, 1254, 1255, 1256, 1257, 1258, 1259, 1260, 1261, 1262, 1263, 1264, 1265, 1266, 1267, 1268, 1269, 1270, 1271, 1272, 1273, 1274, 1275, 1276, 1277, 1278, 1279, 1280, 1281, 1282, 1283, 1284, 1285, 1286, 1287, 1288, 1289, 1290, 1291, 1292, 1293, 1294, 1295, 1296, 1297, 1298, 1299, 1300, 1301, 1302, 1303, 1304, 1305, 1306, 1307, 1308, 1309, 1310, 1311, 1312, 1313, 1314, 1315, 1316, 1317, 1318, 1319, 1320, 1321, 1322, 1323, 1324, 1325, 1326, 1327, 1328, 1329, 1330, 1331, 1332, 1333, 1334, 1335, 1336, 1337, 1338, 1339, 1340, 1341, 1342, 1343, 1344, 1345, 1346, 1347, 1348, 1349, 1350, 1351, 1352, 1353, 1354, 1355, 1356, 1357, 1358, 1359, 1360, 1361, 1362, 1363, 1364, 1365, 1366, 1367, 1368, 1369, 1370, 1371, 1372, 1373, 1374, 1375, 1376, 1377, 1378, 1379, 1380, 1381, 1382, 1383, 1384, 1385, 1386, 1387, 1388, 1389, 1390, 1391, 1392, 1393, 1394, 1395, 1396, 1397, 1398, 1399, 1400, 1401, 1402, 1403, 1404, 1405, 1406, 1407, 1408, 1409, 1410, 1411, 1412, 1413, 1414, 1415, 1416, 1417, 1418, 1419, 1420, 1421, 1422, 1423, 1424, 1425, 1426, 1427, 1428, 1429, 1430, 1431, 1432, 1433, 1434, 1435, 1436, 1437, 1438, 1

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on which the hands of criminals were struck off. After the  
wards in front of the bottom of the seeds was placed a clock  
iv. It opened directly at one side of the great hall. At some  
arrangement, and dated from the beginning of the 18th century-

ly or partly covered, like that of the castle of Montargis, sometimes these lights of stone were entire- assistance had been ready to them, that condemned them to capital punishment. Sometimes these lights of stone were entire-

NOTE A.O.O. 118. Restored by the aid of old plans of the palace  
 1874-1875. RESTORED BY THE PALACE  
 1874-1875. RESTORED BY THE PALACE  
 1874-1875. RESTORED BY THE PALACE

and two drawings of the collection boxes, that have been furnished in facsimile to form a part of a monograph.

stands as the base of the railway of honor, with two narrow-gauge tracks for riders, and a cross wall with a terrace above. The



those monumentr. One of the most remarkable, although not of a very early period, was the flight of steps built before the wing that connected the S. Chapelle of the palace at Paris with the great hall. This flight dated from the reign of Philip the Fair, and was erected by the care of Enguerrand of Margny. At the accession of Louis the Obsolete, Enguerrand having been condemned to the gibbet, his statue was "cast down from the top to the bottom of the great steps of the palace."<sup>3</sup> It was only about the end of the last (13 th) century, that the great flight of steps of the palace was destroyed, to be replaced by the existing flight (Art. Palais, Fig. 1). Before that flight and a little to the left was planted the maypole. We give a perspective of the flight of steps built at the beginning of the 14 th century.<sup>4</sup> When it was destroyed, booths encumbered its two side walls and were attached to the beautiful gallery of Enguerrand; but the portal seen in our Figure remains almost entire with its three statues. A vault constructed under the great platform permitted passage from one side to the other of the court. The flight of steps of the palace of the counts of Champagne at Troyes presented a similar arrangement, and dated from the beginning of the 13 th century. It opened directly at one side of the great hall. At some yards in front of the bottom of the steps was placed a block on which the hands of criminals were struck off, after the sentence had been read to them, that condemned them to capital punishment.<sup>5</sup> Sometimes these flights of steps were entirely or partly covered, like that of the castle of Montargis, (Art. Escalier, Fig. 2), which dated from the 13 th century, and was divided into three flights surrounded by roofs of carpentry.

Note 3.p.118. *Antiquities de Paris*. Corrozet.

Note 4.p.118. Restored by the aid of old plans of the palace and two drawings of the collection Lessus, that have been lithographed in fac-simile to form a part of a monograph.

Note 5.p.118. See *Voyage archæologique dans le département de l'Aube*, by Arnoud. Troyes. 1837.

The castle of Pierrefonds possessed a remarkable flight of steps at the base of the stairway of honor, with two horse-blocks for riders, and a cross vault with a terrace above. We give (Fig. 2) the plan of that flight. The stairway B led to





the great halls of the keep situated at A; it ended next the court,<sup>1</sup> on three flights. The two horse-blocks are at C; three cross vaults cover the steps. A view of this flight of steps taken from the point P (Fig. 3) will relieve us from entering into more ample details. Few arrangements adopted in the construction of castles of the middle ages will be perpetuated longer, since we have also retained it in our days.

Note 1.p.119. See the plan added to Notice sur le chateau de Pierrefonds, by Viollet-le-Duc. 3<sup>rd</sup> edition.

The grand stairway for horses of the chateau of Fontainebleau, whose construction is attributed to Philibert de l'Orme, is a tradition of the middle ages. That of the chateau of Chantilly forms a loggia with two lateral flights and dates from the 16<sup>th</sup> century.<sup>1</sup>

Note 1.p.121. See Du Cerceau, Les plus excellents bastiments de France.

The flight of steps was a sign of jurisdiction, and the provosts rendered justice in the open air from the top of their flight;<sup>2</sup> also the city halls usually had a flight of steps, and the removal of that flight occurred, when it was desired to punish a city for rebellion against its sovereign, as we have seen above in relation to the insurrection of the men of Liege.

Note 2. See the account of the sacristan. (Legrand d'Aussy).

PIERRE (a batir). Stone for building.

The Romans were most intelligent exploiters of quarries that ever existed. The stone structures that they left were always built with the best material to be procured in the vicinity of their monuments. There exists no Roman monument of which the stone is of mediocre quality. When such was absolutely lacking in an extended radius, they employed bricks, rather than place in the work building stones of inferior quality; and if one desires to have good cut stone in a country where the Romans erected monuments, it is only necessary to seek the Roman quarries. This rule has often been of great assistance, when we have had to build in localities, in which the custom of using cut stone had been abandoned for a long time. Even on lands rich in materials suitable for construction, it is interesting to observe how the Roman builders knew how to

exposed with some basaltic and sandstone, however, the latter is not very common. The latter is found in the country of the West (Virginia of West), but is not very common. The latter is found in the country of the West (Virginia of West), but is not very common.

For example, one sees on the road from Vico to Weston, at a certain point is found a monument known by the name of the latter, a Roman column standing in the middle of the road.

It is evident that the latter is not very common. The latter is found in the country of the West (Virginia of West), but is not very common. The latter is found in the country of the West (Virginia of West), but is not very common.

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exploit with rare sagacity the best places, however difficult was the quarrying. This fact can be observed in Provence, Languedoc, in the country of the Edui (vicinity of Autun), Bordelais and Saintonge, and on the coasts of the Mediterranean. For example, one sees on the Roman road from Nice to Mentone, at a point where is found a monument known by the name of the Turbie, a Roman quarry remaining untouched since the epoch at which was erected that edifice. That quarry is in the midst of limestone mountains, located on an almost inaccessible precipice above the little city of Monaco; indeed there is found on that point a thick bed of limestone of very superior quality. These traditions were preserved during the middle ages; men knew the good quarries, and the stone employed was generally chosen with care. There is no country in Europe, that supplies a quantity of stones for building so varied and as good as France.

If one glances at the geological map of France, he will observe that from Mezieres in ascending the Meuse and going southwest by Chaumont, Chatillon-sur-Seine, Clamecy, Charite, Nevers, Chatre, Poitiers and Niort, then descending southeast by Ruffec, Nontron, Exideuil, Souillac, Figeac, Villefranche, Mende, Millaud, then ascending by Andure, Alais, Largoutiere and Privas, he follows an unbroken chain of Jurassic limestone, that he will find again after crossing the Rhone by ascending the Ain from Belley to Salins, and the Doubs from Pontarlier to the limit of the Black Forest. Toward the North from Sable to the mouth of the Orne extends a branch of that chain, which seems to be arranged to distribute over all provinces of France the materials most favorable to construction. In the five great divisions formed by that chain, one finds in the first at the North chalk at Troyes, Arcis, Chalons-sur-Seine and Rheims; coarse limestones in the basins of the Seine, Oise, Aisne and Marne, with sandstone toward the West; on the other side of the Jurassic branch directed toward the Channel are granite and coarse limestones; in the third on the left bank of the Garonne are the green sandstones and the sandstone of Fontainebleau to the foot of the Pyrenees; in the fourth at the centre are granites and crystallized earths; finally in the fifth, which comprises the lower basin of the Rhone, are sandstone and Alpine limestone. Let us add to this collec-

France in materials suitable for building.

resorted from the use of materials of great hardness, first granite; they sought stone of medium hardness and used it in small blocks, as far as possible; and such as the disintegrating of the lands on the surface of France, that it was necessary to go very far to seek limestone, chalk or soft sandstone, except in some provinces like Brittany, on the upper Garonne, and at the Gironde near Gironde and Angoulême. Moreover, granite was exploited the countries with skill and care; the motive force of China was established in Chinese country, as well as that of Gironde, and seemed to move on their shoulders the collection to find themselves in the vicinity of rich quarries. Indeed, we see that the greatest part of the material being dependent on these two appears was built in France on that Chinese claim, that divides the territory into five parts, and that the architecture of the two orders, and particularly that of China, received on a great scale, received a marked influence from the use of the materials, while in countries in which building stones are hard, low and soft, as in the plains of the Seine and Oise, for example, we see that the Chinese architecture is influenced by the nature itself of the building material employed.

When Chinese architecture was adopted, it was not to receive a new system from the different materials furnished by the country. From the 12th century were simultaneously employed a series of very different materials according to the nature of the stone, as it is easy to perceive in reading our old construction. Then we find not only before difficulties in transportation, but that what is considered as hard is not necessarily so because of certain stones, whose quality was chosen for a special object. Thus for example, we are selected for the monumental columns of the choir of Vézelay, built about 1140, and stones from Combray, whose quarry is 12.7 miles from the abbey, although there was some distance for transportation as a small distance; that at Saint-in-Auxois we see in the work that similar stone of Bouillay, which receives a polish; that at Sens and Bourges stones from Paris to build the walls of the



collection the volcanic earths with lavas and basalts at the centre, and we shall have a survey of the wealth possessed by France in materials suitable for building.

Until the end of the 12 th century, constructors evidently recoiled from the use of materials of great hardness, like granite; they sought stone of medium hardness and used it in small blocks, as far as possible, and such is the distribution of the lands on the surface of France, that it was necessary to go very far to seek limestone, chalk or soft sandstone, except in some provinces like Brittany, on the upper Garonne, and at the Centre near Gueret and Aubusson. Monastic establishments exploited the quarries with skill and care; the mother house of Cluny was established in Jurassic country, as well as that of Clairvaux, and seemed to impose on their daughters the obligation to found themselves in the vicinity of rich quarries. Indeed, we see that the greatest part of the monasteries dependant on these two abbeys are built in France on that Jurassic chain, that divides the territory into five parts, and that the architecture of the two orders, and particularly that of Cluny, robust and on a great scale, received a marked influence from the use of the materials, while in countries in which building stones are thin, low and soft, as in the basins of the Seine and Oise, for example, we see that Romanesque architecture is impressed by the nature itself of the building material employed.

When Gothic architecture was adopted, it knew how to derive a marvellous system from the different materials furnished by the ground. From the 12 th century were simultaneously employed stones of very different qualities according to the need, as it is easy to perceive in reading our Art. construction. Then men did not recoil before difficulties in transportation, that must be considerable when it was necessary to procure certain stones, whose quality was proper for a special object. Thus for example, we see employed for the monolithic columns of the choir of Vezelay, built about 1190, hard stones from Contarnoux, whose quarry is 18.5 miles from the abbey, although there was stone suitable for construction at a small distance; that at Semur-in-Auxois we see in the work that admirable stone of Pouilleraux, which receives a polish; that at Sens men brought stone from Paris to build the hall of the s

...; that as shown at the end of the 19th century we see  
...  
... which is would have been impossible to erect with  
...; that such a later at Paris we see the same  
... and demand some from the fact that the loss of  
... and to erect certain parts of the structure as is  
... these examples, which we could multiply indefinitely,  
... the connection of the Gothic period devoted to  
... along attention to the choice of the stones, that they placed  
... in the work. When the Gothic style was definitely accepted  
... over the entire surface of France about the end of the 12th  
... the construction did not hesitate in conforming to  
... the taste of the time, to employ stones that certainly by  
... their means scarcely lent themselves to receive those forms.  
... this about 1270 in the case of the cathedral of Limoges was  
... of granite, that of the cathedral of Clermont of lava  
... from Volvic; and about the middle of the 13th century, when  
... of the Abbey of St. Michael-en-Yver was lime-  
... of granite, without being obliged to use different  
... in certain places of that material; that at the beginning  
... of the 14th century we saw a number of very hard granites  
... the variety and abundance of the old cathedral of Amiens  
... (St. Denis).  
... in the section of the monument erected about the middle of  
... it is easy to recognize that there, even more than during the  
... period, we found a considerable number of gran-  
... this stone material, and that they now use the granite  
... stones according to their color, and with systematic order.  
... that for example there was not placed in a facing  
... stone of a lighter quality suitable for making moldings col-  
...  
... in one of our cathedrals built with a luxury of extraordinary  
...; we speak of the cathedral of Amiens. When the con-  
... ments have proceeded with as much care as economy in the use  
... of the materials. The stones employed in the cathedral of Pa-  
... are all taken from the same quarry, and formerly existed in  
... in the soil of St. Jacques, and each extent denotes the plan  
... of reference to St. Jacques and Amiens.  
... The facade is entirely constructed in rock of the high bed  
... for the base, in soft limestone for the great sculptures (a layer



synod; that at Troyes at the end of the 13<sup>th</sup> century we see the constructors seek lias at Tonnerre and build the church of S. Urbain, which it would have been impossible to erect with other materials; that much later at Paris we see the architects demand stone from Vernon for restoring the rose window of S. Chapelle, and to erect certain parts of the mansion de la Tremoille. These examples, which we could multiply infinitely, prove how the constructors of the Gothic period devoted scrupulous attention to the choice of the stones, that they placed in the work. When the Gothic style was definitely accepted over the entire surface of France about the end of the 13<sup>th</sup> century, the constructors did not hesitate in conforming to the taste of the time, to employ stones that certainly by their nature scarcely lent themselves to receive those forms. Thus about 1270 in the choir of the cathedral of Limoges was built of granite, that of the cathedral of Clermont of lava from Volvic; and about the middle of the 15<sup>th</sup> century, the chevet of the abbey church of Mt. S. Michel-en-Mer was likewise of granite, without being occupied by the difficulties in cutting presented by that material; that at the beginning of the 15<sup>th</sup> century was constructed of very hard sandstone the sanctuary and transepts of the old cathedral of Carcassonne (S. Nizaire).

On inspection of the monuments erected during the middle ages, it is easy to recognize that then, even more than during the Gallo-Roman period, men worked a considerable number of quarries since abandoned, that they knew how to use the quarried stones according to their quality, but with scrupulous economy; i.e., that for example there was not placed in a facing stone of superior quality suitable for making monolithic columns, cornices, gutters or tracery. This fact is remarkable in one of our edifices built with a luxury of exceptional materials; we speak of the cathedral of Paris. There the constructors have proceeded with as much care as economy in the use of the materials. The stones employed in the cathedral of Paris all came from the rich quarries, that formerly existed under the hill of S. Jacques, and that extend beneath the plain of Montrouge to Bagneux and Arcueil.

The facade is entirely constructed in rock of the high bed for the faces, in soft lias for the great sculptures (a layer





having up to 3.0 ft. thickness), and in gypsum for the drips, cornices and little columns, (bed 1.5 ft. thick at most). The soft lias from the quarries of S. Jacques behaves well when set on edge, so that with this stone was made the open arcade of the great gallery below the towers. Gypsum has given an incomparable material for the rose window and for the longer columns of the gallery, as well as for all the drips of the terraces. Among these materials, one also meets in the surfaces and for the caps of the battlements of the towers the old royal bed of Bagneux, that is 2.3 ft. thick, and the great bed of Montrouge, that is 2.1 ft.; these last stones are admirably preserved. In the foundations we have recognized the use of the soft stone of the plain, and particularly of that kind termed firm, that runs to 3.3 ft. thick; sometimes the green bed, though rarely.

The great internal columns of the nave, that are 4.3 ft. diameter, are built of courses of the low rock of Bagneux or of S. Jacques, which easily averages 1.6 ft. But the two piers of rectangular section that terminate the nave at the transverse aisle, which piers have a section relatively weak, are entirely erected in beautiful courses of gypsum from Montrouge, which is 1.3 ft. The transverse arches, archivolts and diagonal arches of the vaults are generally of the free bed of the white bed of Montrouge, which runs from 1.0 to 1.15 ft. Thus the constructors have employed the stone, always retaining to the height of the quarry layer, contenting themselves with always entirely removing the crust or clayey defects, but without cutting with the sandstone saw.<sup>1</sup> Further, they set these materials on their quarry beds, when they did not adopt the system of frankly setting them on edge as shores (Art. Construction), setting the bottom bed below. This precaution is particularly observed in the foundation courses.

Note 1.p.124. Then the saw for sandstone was not used, and there are a good number of departments in France, in which it is not yet employed. Those are where building is best done, (it is necessary to state).

As we have stated, the Romanesque construction especially sought soft stones, stone of the plain, from the vicinity of Paris, the free beds. The choir of Maurice de Sully, except the piers and little columns, is entirely built of materials





of mediocre hardness, low and small. But from the beginning of the 13<sup>th</sup> century, the new lay school on the contrary sought very firm and large materials. Then in the construction of the cathedral of Chartres was employed that limestone of B Berchere, of such a rude appearance but so solid, and that gives blocks 3.3 ft. high with lengths of 9.8 to 13.1 ft.; that at the cathedral of Rheims were set those courses 3.9 ft. high and which cannot be found today in the quarries that supplied them, that are employed lias and the hardest gypsum, taking care to remove the soft layers; that are rejected as far as possible the friable beds, hollow beds without vigor.

The end of the 13<sup>th</sup> century brought still greater care into the choice of stones. It suffices to examine the construction of the church of S. Urbain of Troyes, of the choir of Narbonne, of the transept gables of the cathedral and palaces of Rouen, of the abbey church of S. Ouen of Rouen, of the castle of Vincennes, to recognize that the constructors knew perfectly the qualities of the limestones, and that they selected with an attention that might serve as an example to us. In the 15<sup>th</sup> century men are inclined to use by preference soft stones, but still these are scrupulously chosen. In the 16<sup>th</sup> century this important part of the art of building is too frequently neglected, the materials are not uniform, are taken by chance, and employed without taking account of their properties.

#### EMPLOI DES PIERRES A BATIR SUIVANT LEURS QUALITIES.

##### Use of Building Stones according to their qualities.

Several causes contribute to destroy the limestones suitable for construction, and causes that act have no effect on others. Farther, the combining of certain stones is injurious to some of them. The most energetic destructive principles are the salts developed by dampness even in the interiors of stones, and the alternation of heat and cold. All stones, sandstones, even granites and limestones, contain a notable quantity of water, and absorb dampness from the atmosphere, when they dry. This property is essential to the connection of their molecules, and at the same time is the cause of their destruction. If the stones are placed in elevation near the ground, and that moisture brings with it salts, that tend to crystallize by the effect of dryness of the air, forming as many little



water, but separates the molecules of water and even of  
 crystals. These materials also contain in their water of  
 crystallization, and the atmospheric moisture passes to water without crystallization.  
 A certain stone in water or under the soil will never become  
 one, but remains after a year in the air. The question is the  
 one, not to deprive the stones of all moisture, but to act so  
 as to prevent them, so that this moisture may not from the outside  
 toward the inside, and thus from the exterior to the exterior;  
 that the salts contained may always be in solution, or that  
 they remain in the latent state. For example, assume a lime-  
 stone set at 5 (Fig. 1) on a course of cut stone with a four-  
 sided section of concrete or rubble; the effect of capillarity, i.e.,  
 because of the absorbent action of thin stones, the moisture  
 will be drawn at A, even at the heart of the stone, than  
 at the external surface dried by the air; hence the salts will  
 tend to come to crystallize in the direction of the arrows so  
 these external surfaces, and will gradually disintegrate them.  
 Assume that between thin stones B of the masonry and the  
 course C of cut stone is inserted an impermeable sheet of lead  
 or of oilman, the moisture that passes the surface will be  
 one this surface to be more moist, even at the moment of the  
 emission of water vapor than at the center; therefore, this wa-  
 ter will be carried first by the air; the salts could be de-  
 veloped to come to the surface will be washed, dissolved and  
 removed by the evaporation of external water, and cannot devel-  
 op crystals, or consequently remove the masonry. In the case  
 of complete isolation of the stone protected from the weather  
 of the ground, the water passes it in, the water inside will  
 its surface be washed and dried, and the water will pass to  
 preserved. Assume the Fig. 2; assume (Fig. 3) at A, that a stone  
 is placed under a building. However, concrete in the stone of a  
 which this water is water, it tends to absorb a certain quan-  
 tity of the water that runs in the hollow. The stone is im-  
 permeable to the air and in the water tends to take from the interior  
 part of the water that has penetrated it; some water will be  
 in the direction of the arrows, i.e., being more abundant and  
 less rapidly dried in the heart of the stone than at its sur-  
 face, it will dissolve the internal water, which will come to  
 crystallize on the surface, and will remove pass at first in  
 that and then in solution. For it is known that water B and the



wedge, that separates the molecules of sandstone and even of granite. These materials also contain in their sides salts, & that the atmospheric moisture causes to work without ceasing. A certain stone in water or under the soil will never decompose, but changes after a year in the air. The question is then, not to deprive the stones of all moisture, but to act to preserve them, so that this moisture may act from the outside toward the inside, and that from the exterior to the exterior; that the salts contained may always be in solution, or that they remain in the latent state. For example, assume a limestone set at B (Fig. 1) on a course of cut stone with a foundation of concrete or rubble; the effect of capillarity, i.e., because of the absorbent action of this stone, the moisture will be greatest at a, even at the heart of the stone, than at the external surface dried by the air; hence the salts will tend to come to crystallize in the direction of the arrows to these external surfaces, and will gradually disintegrate them. Assume that between this stone B of the substructure and the course C of cut stone be inserted an impermeable sheet of lead or of bitumen, the rainwater that bathes the surface will cause this surface to be more moist, even at the moment of the emission of water vapor than at the centre; further, this water will be quickly dried by the air; the salts <sup>that</sup> could be developed to come to the surface will be washed, dissolved and removed by that abundance of external water, and cannot develop crystals, or consequently remove the surfaces. In the case of complete isolation of the stone protected from dampness of the ground, the more porous it is, the more easily will its surfaces be washed and dried, and the better will they be preserved. Resume the Fig.; assume (Fig. 2) at A, that a stone a is placed under a gutter. However compact is the stone of which this gutter is made, it tends to absorb a certain quantity of the water that runs in its hollow. The stone a is dried by the air and in its turn tends to take from the gutter a part of the water that has penetrated it; that water will act in the direction of the arrows, i.e., being more abundant and less rapidly dried in the heart of the stone than at its surface, it will dissolve the internal salts, which will come to crystallize on the surfaces, and will remove these at first in dust and then in scales. But if between this gutter B and the



above because an interposed an incompressible body O, that is to say, as in the preceding case will be wanted on the exterior of the film or membrane of this very substance from the surface, and the water cannot crystallize on its surface. The case of H. fat, the royal oil of S. Martin, which are preserved for centuries in free air or on surfaces are perfectly preserved from all internal changes, fall into this class. Under influence of certain kinds of heat action, that is to say, after a certain time of 12. Although in this case the part above remains intact, the lower portion is rapidly decomposed by the water that runs through it and crystallizes in the surface; even frequently the mass of the stone has to be melted first, while the decomposition is very advanced at 0.01 inch inside. For example, take (fig. 4) a slice of hard stone placed on a cornice of stone from S. fat, and one will soon see the trace of that stone like the scales of a fish, showing the profound alteration beneath the surface. Even this trace that covers certain stones contributes to hasten the work of decomposition effected by the water, by increasing the surface area from the contact of air. The stone being no longer seen on the external surface of stone, there has a thickness of 0.01 or 0.02 inch, the water crystallizes under such influence, that they cannot evaporate, and certain injuries received only when the stone falls off. Crystals evolved during the period of the middle ages for centuries and have the advantage of not retaining soluble and of transmuting to soluble. These stones that cover these structures are really protected, and it was when the alterations that are observed under the surface of the stone are the same as the modern stone. The consequence of the middle ages had a fully developed stone structure as of decomposition of stone, and they have frequently been left behind, either associated with on surface or under, or by leaving under their cells a space void or filled by an interstitial material, such as oil cement or resin. They had no less observed the effects produced by adjacent stones on each other. From the experiments, having the property of crystallizing a trace quantity of water, the crystalline form of the stone and of the structure. These stones have a number of radiations with the same effect that really evolved material, there was also crystalline structure that the water and crystalline structure.



stone beneath be interposed an impermeable body C, that lower stone as in the preceding case will be washed on the exterior by the rain or moistened by fogs more abundantly than its heart, and the salts cannot crystallize on its surface. The stone of S. Jean, the royal bed of S. Maximin, which are preserved for centuries in free air or on surfaces are perfectly preserved from all internal dampness, fall into dust if set under gutters or cornice slabs of hard stone, that receive rainwater and absorb part of it. Although in this case the hard stone remains intact, the stone beneath is rapidly decomposed by the salts that pass through it and crystallize in its surface; even frequently the crust of these stones has remained firm, while the decomposition is very advanced at 0.04 inch inside. For example, take (Fig. 3) a slab of hard stone A placed on a cornice B of stone from S. Leu, and one will soon see the crust of that stone rise like the scales D, showing the profound alteration beneath the surface. Even this crust that covers certain stones contributes to hasten the work of decomposition produced by the salts, by protecting the subsurface from the contact of air. The pores being no longer open on the external pellicle of stone, that has a thickness of 0.04 or .02 inch, the salts crystallize under that pellicle, that they cannot traverse, and produce injuries perceived only when the crust falls off. Mouldings employed during the period of the middle ages for cornices and bands have the advantage of not retaining moisture and of transmitting it rapidly. Thus stones that cover those projections are really protected, and do not show the alterations that are observed under the cornice slabs of the Renaissance or the modern epoch. The constructors of the middle ages had so fully observed these phenomena of decomposition of stones, that they have frequently isolated gutters, either supporting them on corbels or arches, or by leaving under their beds a space void or filled by an impermeable material, such as oil cement or resin. They had no less observed the effects produced by adjacent stones on each other. Thus the sandstones, having the property of containing a great quantity of water, rapidly absorbed that of the ground and of the atmosphere. When above those courses of sandstone were placed stones that easily exuded salpetre, there was soon produced decomposition near the bed touching the sandstone, and t



and increased each year. The  
again shows that the process of limestone is not  
such a simple matter of water as the limestone, and  
were never. In fact, the limestone is not  
is also not a process of limestone in a limestone  
by means of limestone, they look like a solid mass  
the modern quality, and sensitive to the effect of water  
the, or rather that treated between the limestone and the  
limestone a set of white facies. These methods are very  
early enclosed during the time of its formation.  
All limestone or leaving the water contains a considerable  
amount of water; as soon as exposed to the air, a great part  
of the water evaporates and comes sensibly to the surface.  
In so doing, this water carries with it a certain quantity of  
lime, which is solution. This explains the fact that  
forming a thin and resistant crust, that not only protects  
the stone from the external agents, but gives it a certain  
covering that nothing can replace. The character of the  
little water having and the action of water is not only  
as on the very surface, but also in the interior, it results that  
this action was formed on the surface and not on the whole  
as on the face, and that the completed surface was relatively  
covered by a thin crust of water, which is called water.  
This is a double advantage; a surface better protected  
over the whole, a perfectly uniform and water color given by  
the natural action. The water action of erosion is  
only of blocks and of a few feet high, after the com-  
pletion of the surface, removing from the surface the  
the fact is not only and aesthetically more, results in fact  
and forever lost protection, which is only found on the  
and the stone is finally taken from the water. This  
modern action is particularly important for the preservation  
of soft stones, such as the grey of Gizeh, and stones of  
limestone, the limestone of limestone, and limestone of  
limestone, soft limestone of limestone, stones of limestone,  
limestone and limestone, limestone and limestone. The fact is  
shall be said of that other action of erosion, which is  
surface? This fact is removed the protection element,  
that has preserved them for several centuries; the stone is  
killed, so that the preservation of the stone is not



this decomposition never stopped, but increased each year. The same stones being set on courses of limestone did not absorb such a great quantity of water as the sandstone, and perhaps were never decomposed. Thus when the constructors of the middle ages set courses of sandstone in a substructure surmounted by courses of limestone, they took care to choose these among the compact qualities, not sensitive to the effect of saltpetre, or indeed they inserted between the sandstone and the limestone a bed of slate (schist). That method was very frequently employed during the 14<sup>th</sup> and 15<sup>th</sup> centuries.

All limestones on leaving the quarry contain a considerable amount of water; as soon as exposed to the air, a great part of the water evaporates and comes successively to the surface. In so doing, this water carries with it a certain quantity of lime carbonate in solution, that crystallizes on the surface, forming a firm and resistant crust, that not only protects the stone from the external agents, but gives it a patina, a covering that nothing can replace. The constructors of the middle ages having had the custom of entirely cutting the stone on the yard before hoisting and setting, it resulted that this patina was formed on the mouldings and sculptures as well as on the faces, and that the completed edifice was uniformly covered by that crust produced by what is called quarry water. This was a double advantage; a surface better resisting atmospheric agents, a beautiful uniform and warm color given by that natural patina. The modern custom of erecting edifices only of blocks and of cutting the facing long after the completion of the setting, removing from those materials  $\frac{3}{8}$  to  $\frac{3}{4}$  inch in thickness and sometimes more, results in destroying forever that protecting crust, since it only forms on surfaces when the stone is freshly taken from the quarry. That modern custom is particularly injurious for the preservation of soft stones, such as the royal bed of Oise, soft stones of Paris, the limestones of Saintonge, Caen, Alpine limestones of Beaucaire, soft limestones of Burgundy, stones of Molènes, Mailly-la-ville, Gourson and Tonnerre; the chalks. But what shall be said of that other custom of strongly scraping old surfaces? Thus from them is removed the protecting element, that has preserved them for several centuries; the stone is killed, to use an expression of the trade. Thus after that





barbarous operation, one frequently sees materials that presented no sign of change, decompose rapidly on the surface, effloresce, then become hollowed, without being able to stop the disease that has attacked them.<sup>1</sup> Further, soft stones are not the only ones that are covered by a resistant patina when freshly cut. hard stones like lias, and gypsum present the same phenomena, and we have seen lias in works for five or six hundred years, that had assumed a surface scarcely to be cut with the chisel, when at  $3/16$  inch depth it could be scratched with the nail. Stones called cold, like those from the quarries of Chateau-Landon, for example, are the only ones that lose nothing in being cut long after being quarried. As for sandstone, everyone knows that they can be cut only when fresh from the quarry. Certain red sandstones from the Vosges cannot be cut with tools at the end of several years, although workable on leaving the ground.

Note 1.p.129. In this case, silicifying well done is the only means to be used to render the stone thus coated, hard and resistant to ensure durability. Silicifying must always be employed when one has had the unfortunate idea of scraping the surfaces of monuments, and even when dressing is done after the stone has lost its quarry water.

It is always well to take one precaution when erecting edifices without cellars; this to interpose in one bed of a course above the ground a layer of impermeable material, like bitumen or fat cement, paper heavily tarred, or a bed of slates. This precaution stops the moisture rising in walls from the ground, and prevents the stones from exuding saltpetre. All the monuments of Poitou, many among those of Vendee and Saintonge, show at about 6.6 ft. above ground on the exterior a zone greatly altered by the action of the salts. This proves the accuracy of the statement previously made, i.e., that the salts act on limestones only where they are no longer held in solution or become crystallized. Indeed, the lower courses of the walls in the monuments of those provinces, all built of soft limestone, that perfectly resists the action of the air, are saturated with dampness, but do not decompose; this only occurs at the height at which the effect of capillarity ceases, when the stone is dryer and allows the salts to crystallize, and there commences the decomposition of the external surfaces.

Various ideas that this decomposition is caused by the action of the moon, and water as first is an insignificant stumbling-block later is very poor. The fact is that this sort of decomposition is rarely manifested except in a southern exposure, slightly at the east and west, never at the north; one understands that the heat of the solar rays hastens the crystallization of the salts above the hard zone, where they are held in solution. Further, the south is the most unfavorable exposure for the preservation of materials suitable for building in France:—1, because in our climate the southern wind brings rain, that weakens the surface, 2, because the differences of temperature are rapid and great in that exposure in winter. At night it freezes at  $46.4^{\circ}$  at a north exposure and at  $44^{\circ}$  at a south exposure in clear weather; but in the day, it rises to  $72^{\circ}$  in the full sun. Materials more or less perishable, that suffer during some hours from differences of temperature, change more rapidly than those exposed to a nearly uniform temperature, even if very cold; but we think that the moon has nothing to do with this, unless that moon full, it presents itself at the same side of the horizon as the sun.

#### PIERRE. Gable Wall.

A wall terminating in a gable is according to the inclination of a gable roof and forming an enclosure before the entrance of the courtyard. A gable building is composed of two gables and two gable walls. According as the building is turned, it presents as its facade either a gable or a gable wall. The facade of a gable building is an actual gable wall. The north and south gables of the transept of the cathedral of Paris are terminated by two gables. Houses erected during the Renaissance epoch in France usually present an gable wall on one street, and a gable wall facing the other party wall, but later and more the middle of the 17th century, the habitations sometimes show one of the gable walls on the street. This method became very rarely during the 18th and 19th centuries, and then the gable walls were frequently built of brick or stone. (Fig. 1, Plate 1, and Plate 2, Fig. 1.)

The form of construction which the gable walls present occupied the architects of the middle ages. (Fig. 2, Plate 1, and Plate 2, Fig. 2.)



Masons claim that this decomposition is caused by the action of the moon, and which at first is an insignificant crumbling, then later is very deep. The fact is that this sort of decomposition is rarely manifested except in a southern exposure, slightly at the east and west, never at the north; one understands that the heat of the solar rays hastens the crystallization of the salts above the damp zone, where they are held in solution. Further, the south is the most unfavorable exposure for the preservation of materials suitable for building in France:-- 1, because in our climate the southern wind brings rain, that sweeps the surfaces, 2, because the differences of temperature are abrupt and great in that exposure in winter. At night it freezes at  $46.4^{\circ}\text{F}$  at a north exposure and at  $44^{\circ}$  at a south exposure in clear weather; but in the day, if the temperature of a north exposure remains below  $32^{\circ}$ , it frequently rises to  $50.2^{\circ}$  in the full sun. Materials more or less permeable, that suffer during some hours these differences of temperature, change more rapidly than those exposed to a nearly uniform temperature, even if very cold; but we think that the moon has nothing to do with this, unless that when full, it presents itself at the same side of the horizon as the sun.

#### PIGNON. Gable. Gable Wall.

A wall terminating in a triangle according to the inclination of a gable roof and forming an enclosure before the trusses of the carpentry. A simple building is composed of two eave and two gable walls. According as the building is turned, it presents as its facade either a gable or eave wall. The facade of a Greek temple is an actual gable wall. The north and south portals of the transepts of the cathedral of Paris are terminated by two gables. Houses erected during the Romanesque epoch in France usually present an eave wall on the street, their gable walls then being party walls, but later and about the middle of the 13th century, the habitations sometimes show one of the gable walls on the street. This method became customary during the 14th and 15th centuries, and then the gable walls were frequently built of half timber work. (Arts. Maison, Pan de bois).

The form of construction suited for masonry gables greatly occupied the architects of the middle ages. Indeed, a gable

extending the ordinary dimensions only, and the  
 the stability only in certain conditions, and it is well  
 to remark, if a table will be a party wall between two  
 rooms; if it is only a division wall, it is  
 better as both sides of the doorway of two rooms, it  
 is clear that to make it stable, it is only necessary to  
 attach it to a vertical plane and give it a thickness in prop-  
 ortion to its height; but if this whole wall is attached at  
 one side and located at the other by columns, or walls or half-  
 walls, it is not absolutely fixed, it is liable to move  
 in a vertical plane, it is necessary to take certain  
 suitable precautions to ensure its stability. If the isolated  
 table walls are very high, they present a great area to the  
 wind, their tops are not inclined and are inclined under a weak  
 pressure, either inward or outward, and these great triangles  
 resting on their bases very easily leave the vertical plane,  
 however small the force that affects them.  
 When during the stormy period, the roof has an inclina-  
 tion rarely exceeding 15°, the construction of tables has not  
 been essential precautions; the table was merely a wall  
 wall terminated by two pillars. But when the case is given to  
 the capacity of roofs an inclination exceeding 45°, and this  
 capacity has a base of 25.4 to 30.5 ft., it was instead essen-  
 tial to adopt extraordinary means to maintain it in a vertical  
 plane that supports themselves heavily at the base of stability,  
 left to the force of wind and to the inevitable movement of  
 the timber.  
 Yet already about the last time of the Renaissance period was  
 left the necessity, for having tables exceeding else than a  
 single wall terminated at top by an oblique angle. men believe  
 that they had ensured its stability by means of stones, a  
 and transferred the loads to certain points. It is an exam-  
 ple of one of these attempts on the front wall of the church  
 of St. Honoré in the island of Normandy. The table of this la-  
 table is presented in fig. 1, and its construction dates back  
 to the beginning of the 15th century, but it is really com-  
 mon to four walls with a central opening and divided  
 into three; and the load of the masonry was concentrated at  
 four points from B to C. This construction was the result of  
 various observations. Indeed, masonry behaves a great deal



exceeding the ordinary dimensions only acquires and retains its stability only in certain conditions, that it is well not to neglect. If a gable wall be a party wall between two buildings; if properly speaking it is only a division wall maintained at both sides by the carpentry of two equal roofs, it is clear that to render it stable, it is only necessary to erect it in a vertical plane and give it a thickness in proportion to its height; but if this gable wall is detached at one side and loaded at the other by chimneys, pushed or pulled by carpentry not absolutely fixed, if one claims to maintain it in a vertical plane, it is necessary to take certain suitable precautions to ensure its stability. If the isolated gable walls are very high, they present a great area to the wind; their tops not being loaded may be inclined under a weak pressure, either inward or outward, and these great triangles rocking on their bases very easily leave the vertical plane, however small the force that affects them.

When during the Romanesque period, the roofs had an inclination rarely attaining  $45^\circ$ , the construction of gables did not demand special precautions; the gable was scarcely more than a wall terminated by two slopes. But when one came to give to the carpentry of roofs an inclination exceeding  $45^\circ$ , and this carpentry had a span of 39.4 to 49.2 ft., it was indeed essential to adopt extraordinary means to maintain in a vertical plane that enormous triangular masonry at the tops of edifices, left to the gusts of wind and to the inevitable movement of the timbers.

Yet already about the last time of the Romanesque period was felt the necessity, for making gables something else than a simple wall terminated at top by an obtuse angle. men believed that they must ensure its stability by means of arches, that transferred the loads to certain points. We find an example of one of those attempts on the front wall of the church of S. Honorat in the island of Lerins.<sup>1</sup> The gable of this facade is presented in Fig. 1, and its construction dates back to the beginning of the 12 th century, but it is really composed of four wide piers A with a central opening and flying buttresses; thus the load of the masonry was concentrated at four points from B to C. This construction was the result of judicious observation. Indeed, masonry acquires a great part



of its elasticity by its weight rather than by the area of the  
 load. It will be seen that the weight of the load is not  
 100 lb. wide and 100 lb. high, we shall have in elevation  
 a unit surface of 100 square ft. and a volume of 100 cu. ft.  
 Taking the weight of a cu. ft. of our stone as 150 lbs., the  
 load will be 15,000 lbs., and the loaded area will be 100 sq.  
 ft. The load being distributed over the area, one square ft.  
 of horizontal area will receive 150 lbs.; one sq. ft. of  
 a wall will receive 150 lbs.; one sq. ft. of a roof will  
 will have 75 lbs.; one sq. ft. of a floor will have 15 lbs.; total  
 27,500 lbs. But if without changing the dimensions or thickness  
 and consequently the weight of the stone, we build a structure  
 across buried in the masonry as indicated at B, we shall have  
 one sq. ft. of horizontal area loaded by 150 lbs.; one sq. ft.  
 of a wall or a roof will receive 150 lbs.; one sq. ft. of a floor  
 15 lbs. In the first case A, the load most loaded is the wall and  
 that receives 150 lbs. per sq. ft., while in the second case B,  
 the wall receives 150 lbs. per sq. ft., the floor 15 lbs. per sq. ft.,  
 and the roof 75 lbs. per sq. ft. In example A, the wall in the  
 second the same surface receives 15,000 lbs., in example B the same  
 surface have 4,500 lbs. This is the second example the loads  
 tend to equalize or to distribute themselves more uniformly  
 over the entire area; the greatest load is not at the middle  
 of the area, but is distributed to two points. A force  
 like the wind or a target can find a resistance more solid  
 in resting on the base, and opposed to its action. The entire  
 weight of construction of the great tables of the great obelisks  
 of the middle ages is established on that very simple principle  
 of the distribution of the load, not according to the  
 shape given by the form of the table, but contrary to that in-  
 dication as shown in example. The distribution of these tables  
 is derived from the system of construction adopted. When the  
 building contains only one story, the column supports the weight  
 transferred to the two ends, the triangle of the table is deter-  
 mined by two elements; but when the building is divided into  
 stories by a wall or a row of piers, the table indicates the  
 internal construction, and the middle is maintained by a but-  
 tress that rises to the apex of the triangle. It there has a  
 triangle which the interior of the wall, the



of its stability by its weight rather than by the area occupied. If (Fig. 2) we erect a solid gable A 13.1 ft. high by 26.3 ft. wide and 1.64 ft. thick, we shall have in elevation a built surface of 172 square ft. and a volume of 285 cu. ft. Taking the weight of a cu. ft. of cut stone at 125 lbs., the load will be 35,270 lbs., and the loaded area will be 45.06 sq. ft. The load being distributed over that area, one square ft. of horizontal area a b will receive 819 lbs.; one sq. ft. of a c or b d will receive 584 lbs.; one sq. ft. of c e or d f will have 351 lbs.; one sq. ft. of e g or f h, 117 lbs.; total 35,270 lbs. but if without changing the dimensions or thickness, and consequently the weight of the gable, we build discharging arches buried in the masonry as indicated at B, we shall have one sq. ft. of horizontal area <sup>a b</sup> loaded by 445 lbs.; one sq. ft. of a c or b d with 960 lbs; one sq. ft. of c e or d f with 222 lbs. In the first case A, the part most loaded is the part a b, that receives 819 lbs per sq. ft., while in the second part B, the part a c or b d receives 960 lbs. per sq. ft. In example A, the areas e f or g h receive only 15,432 lbs., while in the second the same surfaces receive 18,078 lbs. In example A the areas e f, g h, each receive 2,205 lbs., in example B the same surfaces have 4,630 lbs. Thus in the second example the loads tend to equilibrate or to distribute themselves more uniformly over the entire base; the greatest load is not at the middle of the base, but is transferred to two points. A force like the wind or a thrust then finds a resistance more solidly resting on its base, and opposed to its action. The entire system of construction of the great gables of the wise epoch of the middle ages is established on that very simple observation of the distribution of the loads, not according to the slope given by the form of the gable, but contrary to that inclination as much as possible. The decoration of these gables is derived from the system of construction adopted. When the building contains only one nave, the points of support are transferred to the two ends; the triangle of the gable is terminated by two abutments; but when the building is divided lengthwise by a wall or a row of piers, the gable indicates the internal construction, and its middle is maintained by a buttress that rises to the apex of the triangle. If there be a fireplace against the interior on the axis of the hall, its





flue appears on the exterior and rises to the apex of the triangle in the best conditions of draft, and serves to abut the construction.

Note 1.p.131. The island of Lerins, that possessed a beautiful old abbey, is situated before the island of S. Marguerite, opposite the roadstead of Cannes.

However these principles of construction of gables were adopted rather late, about the middle of the 12 th century, we see gables built, that are only solid triangular walls, decorated by slightly projecting members, arcades, laps and panels, that add nothing to the stability.

The Latin church of S. Front preceding the existing church, which dates from the end of the 10 th century, possessed at the west a gable of which some traces are seen, and which was built according to these elementary principles, already appearing on the exterior of the monument of Poitou known under the name of the temple of S. Jean.<sup>1</sup>

Note 1.p.132. In *Architecture Byzantine en France*, by M. F. de Verneilh, see the description of the gable of the old basilica of S. Front, and the engraving added, p.93.

The churches of the Basse-Oeuvre at Beauvais and of Montmille present their western gables simply ornamented by a cross and some imbrications.<sup>2</sup> But one of the richest among these gables of Beauvoisis is that which closes the north transept of the church S. Etienne of Beauvais. This gable that some authors date back in construction to the beginning of the 11 th century, cannot be earlier than the beginning of the 12 th. It crowns a rose window surrounded by a series of figures representing a wheel of fortune.<sup>3</sup> The structure of the external surface of the gable wall is entirely composed of very small cut stones, forming a lattice of beams by the manner in which they are set, between the intervals of which are inserted rosettes carved on the surface of a stone. (Fig. 3). This lattice is intersected horizontally by a line of billets and by a very small rectangular opening covered by a round arch cut in a single stone. The angles at the sides and apex of this triangle were restored in the 14 th century, and their original terminations were replaced by three pinnacles. We have tried to supplement this lack by depending on vignettes of manuscripts of the time. The imbrication of the little rubble stones

formed the external depression and out as indicated by dashed  
A, and have the small thickness; this is only a feature which  
before a wall of ordinary masonry. The main structure covers the  
whole and form a fillet over the fillet.

Note 2.2.12. See comments in *London Handbook*, p. 2.

Notes 2.2.13.

Note 2.2.13. See also *Notes on the History of the*

Notes 2.2.14.

A fillet before the construction of this table was erected  
the surface of the fillet was at first in contact with the wall, and  
the fillet was raised by fillets and construction of  
the fillet of two colors (white and black). The fillet (Fig. 2) an  
elevation of the structure table of this structure. The fillet was  
structure is most rational. The surface of the fillet was  
see across the base of the table and is slightly sloped by  
the two surfaces A and B. This construction prevents the spreading  
of the fillet, and the thickness of the fillet is only the width  
of the overhang, that is to say, the width of the projection of  
the fillet. There are two examples and cases of  
fillet and of verticality show that the structure is rational  
to give a certain relative thickness to the fillet of  
fillet. These structures are shown in the fillet and  
seen after because of their height, and cannot be shown as a  
fillet special structure showing the most construction of  
fillet, that they were designed as a whole. In the fillet and  
fillet, the lines of fillet inserted in the masonry and  
to enclose the masonry around the structure of fillet.  
At the fillet of the fillet, a fillet of fillet was to be of a  
fillet before the fillet. The fillet structure are two an-  
gles more or less acute without fillets, fillets and fillet  
fillet structures, with less and cannot be a part of the fillet-  
fillet of the fillet. There are necessary at least two angles  
a fillet on a fillet, or at least a fillet structure. The fillet  
of the structure of the fillet and the fillet further  
fillet a fillet structure. Fillet and have walls of an  
fillet (Fig. 2) fillet fillet. These fillet were shown  
by a fillet also a fillet and fillet and fillet of the  
fillet (fillet) were not in use in the fillet; the  
fillet before this projection, it is slightly necessary  
that the fillet and fillet fillet at the base of the fillet.



forming the external decoration are out as indicated by detail A, and have but small thickness; this is only a facing placed before a wall of ordinary masonry. The rake copings cover the whole and form a fillet over the tiles.

Note 2.p.132. See monuments de l'ancien Besunois, by X. Koller. 1849.

Note 3.p.132. Art. Rose. Also see Album of Villard of Honnecourt, Pl. 41.

A little before the construction of this gable was erected the church of Notre Dame du Port at Clermont in Auvergne, whose gables were richly decorated by billets and incrustations of stones of two colors (white and black). We give (Fig. 4) an elevation of the southern gable of this church. Here the construction is most rational. The cornice of the eave walls passes across the base of the gable and is skilfully stopped by the two buttresses A and B. This cornice accents the crowning of the edifice, and the triangle of the gable is only the mask or the covering, that it covers by means of the projecting coping forming the upper rake. These two examples and those of S. Front and of Montmille show that the Romanesque architects sought to give a certain relative richness to the gables of edifices. These triangular tympanums crowning the walls are seen afar because of their height, and appear to allow an entirely special decoration recalling the wood construction of roofs, that they were designed to conceal. At Notre Dame du Port, the lines of billets inserted in the masonry and serving to enclose the mosaic assumed the arrangement of carpentry. At S. Etienne of Beauvais, a lattice of rounds seems to be placed before the roof. But the lateral terminations are two angles more or less acute without abutments, returns and often without acroterias, were lean and caused a fear of the slipping of the copings. There was necessary at those two angles a stop on a weight, or at least a returned moulding. The form of the carpentry of the roof masked by the gable further required a particular arrangement. Indeed the eave walls of an edifice (Fig. 5) being given, those eave walls were crowned by a cornice slab A receiving the furrings and drain of the roof B (gutters were not in use in the 12 th century); erecting a gable before this projection, it was either necessary that the cornice A should return at the base of the gable, or





that it should stop abruptly at the face of the wall, or that it should be masked by a projection a b; it was further necessary for the coping crowning the gable to serve as a fillet covering the roofing, to prevent rainwater from passing between the rear face of the gable and the tiles or slates. Then (about the middle of the 12 th century) the architects sought different combinations more or less ingenious to satisfy these conditions. The simplest of these combinations, adopted in many edifices of Burgundy and upper Champagne about the middle of the 12 th century, is that which we present (Fig. 6). The cornice of the eave wall being extended to the face of the gable wall, its projection receives the lower ends of the triangle elevated in such a manner as to free the covering and cover it by means of the projection a of the coping. But for this coping to not slip on the slope of the triangular wall, it must necessarily form a part of the course d as indicated in detail A. Then the block d was sufficiently heavy to arrest the slipping of the inclined slabs e. In cutting this stone from the block the masters were naturally compelled to remove the triangle g. Soon instead of that, they left the stone entire and profited by this triangle g remaining to make it a little gable, as we have sketched in detail B. That reserve had the advantage of leaving more weight to the stone, avoiding a hollow, and affording to the eye more stability to that stop course.

Even in conditions built with economy, we see that the architects devote very particular attention to crowning the gables, so as to prevent the passage of rainwater between the roofing and the masonry, without ever having recourse to those flashings of mortar or of plaster, that are easily detached, require continual repairs and have a miserable appearance. Sometimes the tiles cover the rakes of the gables, but at the apex is set a crowning stone covering both slopes of tiles and the ridge tiles of terra cotta, as shown by Fig. 7.<sup>1</sup> At A the terminal of the upper apex of the gable is presented in profile, and at B in perspective. Thus the wall is perfectly preserved by the covering tiles, and the junction of these at the ridge is secured by the terminal stone forming fillets at the sides, in front and behind.

<sup>1</sup>Note 1.p.137. From a chapel of the little church of Flouté-





Flacigny, 15 th century. We have found terminals of this kind on Burgundian gables of houses of the 13 th century.

The system of carpentry and of roofing adopted at the beginning of the 13 th century usually producing an equilateral triangle and sometimes one even more acute, gables assume importance, the edifices being erected on a greater scale than in the preceding centuries, it became necessary to give a bearing suitable for this work in masonry, to combine it with more art. Presenting a very large surface, it was necessary both to decorate and to lighten them, the more because they rose above great openings, rose windows, wide windows, lighting the interiors of the naves. Then the constructors sought to stiffen these great walls left to themselves by combinations of piers and voids skilfully arranged. They erected gables in Burgundy (a province of gold constructors) during the first half of the 13 th century, singularly bold in construction and with a very remarkable decorative effect. We have seen two, built at the same time before the porch of the abbey church of Vezelay and before the nave of the little church of S. Pere-sous-Vezelay,<sup>1</sup> which present both bold construction and a decoration of extreme richness. The gable of the western front of the church of S. Pere had been built with a foresight of the raising of the nave, that never occurred, so that today this gable rises much above the roof. It was to be flanked by two high towers; that on the north alone was built (Art. Clocher, Fig. 70). A great arch (Fig. 8) was designed to trace the penetration of the vault on the front. Beneath this arch opens a rose window that surmounts an opening with tracery.<sup>1</sup> The entire decoration above the archivolt must mask the carpentry, and it presents in an arcade a series of statues of large size. At the top is seated Christ blessing, crowned by two kneeling angels. Beneath Christ stands on a pedestal S. Etienne, then at the right of Christ is the Virgin and on the left is S. Anne. On the right of the Virgin gradually descend the statues of S. Pierre, S. Andrew and a third apostle. On the left of S. Anne are S. Paul, S. John the apostle. Beneath the statues of S. Anne and of the Virgin are seen two heads of demons; the other statues are supported by piers or corbels. Beside the rose window are sculptured the lion and the dragon. The iconography of this gable is then complete and has suffered no





serious mutilations. As for the construction of this important piece of architecture, it consists of a wall built in low courses, stiffened on the exterior by the arcade composed of high courses. The two towers were to abut its two ends; that of the north alone having been built, the gable has bent at the south end; but it was easy to stop that movement by means of a buttress built inside on the wall of the nave, whose existing vault does not exceed the level A. It is not necessary to emphasize the value of this truly masterly composition, and it must be stated that the statuary as well as the ornamental sculpture is treated by a master's hand. The figures are a little tall in elevation, but assume their true proportion in perspective, and form an entirety, surprising by its richness and the beautiful harmony of the lines.

Note 1.p.138. S. Pere for S. Pierre.

Note 1.p.138. This rose window now opens under the roof of the nave.

The gable of the western front of the abbey church of Vezelay was very probably by the same artist, and presents a different arrangement, still more original. It serves as a tympanum for the vaults of the porch that date from the 12 th century; the arcade is open, and lights the porch, and the figures are placed on piers. But perhaps a unique fact, the rakes of this gable, instead of being straight, are formed by two curves producing a pointed arch (Fig. 9).<sup>2</sup> The statues decorating this gable, as at the church of S. Pere, present at the top the seated Christ holding the book of the gospels and blessing; two angels bear a large crown above his head. On the right of Christ is the Virgin and on here left is S. Anne. Two angels holding censers complete the series. Below are seen on the columns S. John Baptist, S. Pierre, S. Paul and S. John, a bishop and a saint, that we are unable to designate. The section of the pier forming the mullion is given by the detail A. The glass being placed at B, there exists a passage between the glazed arcade and the internal somewhat lower arcade (Fig. 1). The construction of this gable is to be studied and explained by the internal elevation. The curve A is that given by the side arch built in the 13 th century under the vault B of the 12 th. A discharging arch C strengthens the side arch and passes under the gallery. (See section D at C'). A second disch-

The first of these is the fact that the  
 structure of the brain is not uniform  
 throughout. It is divided into two main  
 parts, the cerebrum and the cerebellum.  
 The cerebrum is the larger of the two  
 and is responsible for most of the  
 functions of the brain. It is divided  
 into two halves, the left and right  
 hemispheres. Each hemisphere is further  
 divided into four lobes, the frontal, parietal,  
 temporal, and occipital lobes. The cerebellum  
 is smaller than the cerebrum and is located  
 at the back of the head, below the cerebrum.  
 It is responsible for coordination and balance.  
 The brain is also divided into two main  
 parts, the cerebrum and the cerebellum.  
 The cerebrum is the larger of the two  
 and is responsible for most of the  
 functions of the brain. It is divided  
 into two halves, the left and right  
 hemispheres. Each hemisphere is further  
 divided into four lobes, the frontal, parietal,  
 temporal, and occipital lobes. The cerebellum  
 is smaller than the cerebrum and is located  
 at the back of the head, below the cerebrum.  
 It is responsible for coordination and balance.

Note 9.139. At the scale of 1:100.

[illegible]



discharging arch E E' supports the weight of the upper extremity of the gable, the trace of the roof being at a b. Piers F, F' maintain the facing G G' forming the back of the external decoration. The little columns H are isolated and are indicated in the horizontal section of one of the piers of Fig. 9, are then relieved by the side arch, by the arch C' and by that at E'. Further, from the level I they are connected to the portion of the pier on the exterior by projections K rising to beneath the discharging arch C'. The passage L communicates by some steps with the halls of the second stories of the two towers flanking the facade. On the interior as on the exterior this great window produces much effect, and its double arcade is arranged according to a very extended perspective purpose; the balustrade M being only high enough to mask the sill N of the glazed openings; the arches O permitting to be seen in their entire development the openings of those at P, and the small diameter of the little internal columns H in masking the glass. All that is built in beautiful materials, and the sculpture is treated by a master's hand and dates from the middle of the 13th century. The statuary is impressed by a grand character, and frankly appears of the beautiful Burgundian school. (Art. Statuaire).

Note 1.p.139. At the scale of 1 : 100.

At the same epoch in Ile-de-France were erected gables perhaps conceived with less boldness, with an arrangement less original, but in the composition of which is observed a more correct taste, more delicacy and better harmony with the purpose. One notes that the gable of Vezelay is a mask of the roof, but hardly combines with its form. In our good Gothic edifices of the 13th century, those of Ile-de-France, those to which it is always necessary to resort as being the truly classical expression of this art, the gables are indeed made to close the roof, they frankly light and cover it. We cannot find a better example than that furnished by one of the gables of the transepts of Notre Dame of Paris (1257). This gable rises above a rose window 42.7 ft. diameter, and it is itself pierced by a rose window partly blind, that lights the roof. This beautiful composition (Fig. 11) is equally decorative and wisely reasoned. On the great arch that is the side arch of the vault and the archivolt of the rose window is placed





an entablature supporting a balustrade, and that permits communication from the upper galleries at the east with those at the west. The gable proper rises as a recess from the arch of the rose window and rests principally on the side arch; it is more supported by a relieving arch embedded in the construction. This gable is 2.7 ft. thick, is lightened by the rose window that lights the roof, and whose blind portions are only slabs bearing sculptures, by rosettes and reveals. Two great pyramids flank it and form the heads of the buttresses abutting the rose window, and permit a rear stairs to extend and pass above the roof that it covers, at the junction to which it forms a wide fillet, as shown by section A of the portion of the rear gable at B, the section A being made on a b. Three statues decorate the summit of the two lower angles of the gables. That of the apex represents Christ appearing in a dream to S. Martin, clad in the half cloak given to the poor;<sup>1</sup> the two others represent the same S. Martin and S. Etienne.<sup>2</sup> Lighted by the sun, this gable produces a marvellous effect. Further it perfectly emphasizes the roof that it is intended to close; its sculpture is broad, sober, at the proper scale and admirably treated. The rose window of the attic is in perfect proportion to the great rose window that opens in the transept. This composition was never surpassed. The south gable of the cathedral of Amiens was erected about the middle of the 14 th century, and still presents an original arrangement, that approaches the composition of the gable of Vezelay. The great triangle is divided vertically by piers forming a series of buttresses decorated by statues and pinnacles, between which open voids that light the attic. But there the details are too small in scale, are confused and no longer offer that simplicity of lines, that we admire at Paris and even at Vezelay. To not leave these great triangles isolated, men sometimes had the idea in the 14 th and 15 th centuries to abut them by open or blind galleries, that connect their rakes to the abutting pyramids or turrets. One of the best composed of this kind is that of the principal facade of the Church S. Martin of Laon, which dates at the end of the 13 th or beginning of the 14 th centuries. We give (Fig. 12) a perspective view of it. Desiring to give great importance to the two flanking turrets, the architect felt that the gable





between these two turrets would appear meagre; so he has accompanied it by a blind gallery, which terminates the portal rectangularly as a mass, and yet he did not desire to falsify the principle, and he has caused the outline of the roof to reappear through the gallery.

Note 1.p.144. Below the portal is represented at right and left the legend of S. Martin.

Note 2.p.144. The legend of S. Etienne is represented in the tympanum of the portal.

A little before the construction of S. Martin of Laon, the celebrated architect Libergier during the second half of the 13<sup>th</sup> century erected over the portal of the church of S. Nicaise at Rheims a gable joined to the two towers of the facade by an open gallery, which was much more truthful than the mode adopted at S. Martin of Laon. This gallery also places in communication the upper stories of the towers.<sup>1</sup> The gable of S. Nicaise of Rheims was pierced by three round windows lighting the attic, and its front was decorated by imbrications, the last vestige of that Romanesque tradition that we saw frankly accepted in the gable of the church S. Etienne of Beauvais, given above, and in the gables of the provinces of the Centre and West. As at the cathedral of Rheims, the western gable of S. Nicaise was double, repeated in the plane of the rear sides of the towers, and like the front one, this second gable was joined to the towers by an open gallery like that in front. One understands what effect in perspective could be produced by this doubled gallery. We give (Fig. 13) an elevation of the gable of S. Nicaise.<sup>2</sup> It must be stated that the little columns supporting the gallery were doubled to give the depth necessary for a passage on the arcade. (See detail in section A).

Note 1.p.145. Art. Clocher, Fig. 75.

Note 2.p.145. See the precious engraving of De Son of Rheims. (1625). That beautiful church, unique in its kind, was destroyed without reason or necessity at the beginning of the 19<sup>th</sup> century.

It is unnecessary to believe that religious architecture alone erected works of great importance and richness. The gable of the hall of the palace at Poitiers is one of the richest





that one can imagine and one of the most singular in composition. At its base inside is established a fireplace occupying its entire width; the flues of that fireplace boldly pass across the windows that open in the gable. One can obtain an idea of that composition by examining fig. 10 of Art. Cheminée (15 th century). The gable of the great hall of the castle of Coucy was also very richly decorated on the exterior (Art. Salle), and was surmounted by a colossal statue. An immense opening was made under its triangle and largely lighted the hall lengthwise. That gable belonged to the structures erected by Louis of Orleans during the first years of the 15 th century. Among gables in civil architecture the more simply treated, must be cited those of the keep of the castle of Pierrefonds. We present two specimens of them (Fig. 14). They combine with the buttresses of the castle as one may see at A. Behind the projecting crenelations and following the slope of the roof is placed a service stairs for the roofers, that at need could be occupied by defenders. At B is given the section of this gable, the step being profiled at a and the ridge of the roof at b.

The gable C that belongs to the same castle is furnished with triple chimney flues d, that interrupt the stairs, which then continue by means of lead steps on the roof. At D we give one of those gables of barns of the 13 th century, with its axial buttress designed to abut the thrust of the arches resting on a row of columns and reducing the spans of the carpentry. The architects of the middle ages did not commit the fault of equipping gables with buttresses according to the internal arrangement, either to mark the division walls or to abut the arches. They made proof in that important part of their edifices of the freedom that we love to find in their most modest works, as well as the richest. The gable emphasizes the cross section of an edifice, and it is then the part that indicates most clearly its construction and purpose, the architects have thus understood its function, and have been very careful not to conceal it. To see a gable from the exterior, one easily seizes the different divisions of the building and its construction, whether it is vaulted or ceiled, if it only has a ground story, or is composed of several stories. The chimneys are habitually placed in the axes of the gables,





so as readily to bring their flues to the ridge of the roof and avoid their isolation. Thus these flues form actual buttresses, which stiffen the great triangles of masonry and give them more bearing. The establishment of gables on civil edifices also had the advantage of avoiding hips in carpentry, costly in construction and maintenance, and of furnishing fine attics well enclosed, ventilated and healthy.

#### PILASTRE. Pilaster.

During Grecian antiquity the pilaster or rather the ante, as this word sufficiently indicates, is the head of a wall, or a projecting angle built at the square return of a wall. On the wall of a cell, the ante is the reinforcement erected at A or B (Fig. 1), which reinforcement bears a capital and sometimes rests on a base. In Roman architecture, what is called a pilaster is the projection of a column from the face of a wall marked by a small projection (of the wall) (Fig. 2), A being a column and B its pilaster; sometimes the isolated or engaged column disappears, for example as around the upper story of the Coliseum at Rome and the pilaster alone remains. During the best period, the Greeks never gave to the ante the same capital as the column; but under the empire the capital of the pilaster is only the projection of the capital of the column, as the pilaster itself is merely the projection of the shaft. If the pilaster be alone, if it is not the projection of the column, it has the capital of an order, Doric, Ionic, Corinthian or Composite, but does not take a special capital.

In the first times of the middle ages the architects did not take the trouble to project the engaged column on the wall, but they sometimes placed pilasters as a decoration or reinforcement of a wall. Small pilasters are seen on the exterior of the monument of S. Jean at Boitiers; they are again found on the western gable of the Latin basilica of S. Front of Périgueux, accompanying two stories of arcades,<sup>1</sup> and later about the end of the 10<sup>th</sup> century, in the interior even of that edifice. These pilasters are crowned by false Corinthian capitals, and bear an upper arcade (in the tympanums closing the great bays of the domes), that form a continuous passage around the edifice. Windows are opened in the arcade beside the





choir and the transept. But this example that is found repeated in the old part of the church of the city (cathedral) at Pereguenx, is not generally followed in the edifices of the West. The engaged column replaces the pilaster, while in upper Burgundy, Morvan and upper Champagne, the Roman pilaster persists very late, until the beginning of the 13<sup>th</sup> century. There still exist at Autun two city gates of the Gallo-Roman epoch, the gates of Arroux and of S. Andre, that are crowned by a defensive gallery consisting of a series of arches between which are arranged pilasters, fluted at the gate of Arroux and plain at gate S. Andre. This arcade with pilasters evidently served as a type for the architects, who in the 12<sup>th</sup> century erected the cathedrals of Autun and of Langres, of the churches of Saulieu and of Beaune. But whether there still existed at that epoch great Roman monuments with pilasters, or that the galleries of the Roman gates of Autun may have inspired the architects with the idea of using the pilaster, and the fluted pilaster, in the composition of the piers themselves of the edifices cited, we see the pilaster applied on a great scale at Langres, Autun, and in some other monuments of those provinces. At Langres great false Corinthian pilasters form the heads of the buttresses of the apse on the exterior. At the cathedral of Autun, the internal piers have engaged fluted pilasters (Art. Pilier). Even at Vezelay in the nave above the archivols of the side aisles, pilasters bear the side arches of the great vault, while one never sees pilasters employed in the Romanesque edifices of Ile-de-France. The pilaster is also sometimes employed in certain Romanesque monuments of Provence, and it is habitually fluted. In fact in French architecture of the middle ages, the pilaster is an exception, and its use is due to the near presence of Roman monuments.

Note 1.p.150. In *Architecture Byzantine en France*, by M. F. Felix de Vernet, 1851, see the description of the Latin church of S. Front, p. 92

PILE. Pier. (Art. Pilier).

PILIER. Pier.

An isolated vertical stone support intended to bear the car-

property or variety of surface. The other points to the arc-  
 mitering of the little eyes. The French and German balls are  
 also, possibly speaking, for both have been given to a  
 the collar and in these balls and several kinds of concrete,  
 and in the balls some ellipses, for example, like the balls  
 of the latter, shorter and rounded the latter. The latter is  
 too elastic to resist to vertical pressure; for it is  
 round the vertical line, it will be bent vertically, or a  
 the resistance of the surface of vertical balls on it will be  
 elastic each other so as to produce themselves in a vertical  
 pressure. When the series of chambers or balls were covered by  
 catheters, there was no need for living the air escaping  
 by themselves, and the reason by the combination of their hor-  
 izontal section to resist the elastic pressure of vertical; but  
 when the elastic is flattened the balls for catheters for a  
 convex section, the catheters observed to give to a  
 the balls form which is filled with the pressure. They form  
 instead of the surface the surface of the cylindrical col-  
 umn, and then become several columns; then they affect to the  
 of of course several small columns; they would have  
 resistant combinations as to the moment when about the middle  
 of the 12th century that architectural system of catheters  
 used system of construction. Then the plan was changed only  
 the initiative of the walls or of the pressure acting on it.  
 before then the other architectural system during the middle  
 ages, the other catheters the catheters and others of the stone  
 stone and the vertical resistance of the catheters, that they  
 acted at the moment when the air was into the balls of the  
 by catheters; this is what enters into the catheters elliptical-  
 ly vertical catheters the catheters combinations, that the  
 after suffered from the 12th to the 13th centuries.  
 In the French balling the air is contained and the latter are  
 contain a vertical wall, either by itself or by others. In  
 the form of catheters the catheters; in these the walls from  
 one to the other extend horizontally. A vertical catheter, but  
 and this wall, consequently a sufficient resistance if the  
 columns were of earth stone, of bricks or stone. All walls  
 walls of brick are not heavy, however, however light, there  
 only a very weak pressure. But when the air of catheters  
 the pressure of the walls, the walls take a convex resistance



carpentry or vaults of edifices. The pier belongs to the architecture of the middle ages. The Greeks and Romans built no piers, properly speaking, for this name cannot be given to the column nor to those thick and compact masses of concrete, that in the great Roman edifices, for example, like the halls of the baths, supported and abutted the vaults. The pier is too slender by itself to resist oblique thrusts; for it to retain the vertical line, it must be loaded vertically, or the resultants of the thrusts of vaults acting on it must neutralize each other so as to combine themselves in a vertical pressure. When the naves of churches or halls were covered by carpentry, there was no need for giving the pier extraordinary strength, and for seeking by the combination of their horizontal section to resist the oblique pressures of vaults; but when men claimed to substitute the vault for carpentry for covering interiors, the constructors endeavored to give to the piers forms suited to fulfil that new purpose. They first increased out of measure the diameter of the cylindrical column, and then grouped several columns; then they added to piers of square section engaged half columns; they sought thus resistant combinations up to the moment when about the middle of the 12 th century that architecture adopted an entirely new novel system of construction. Then the pier was further only the derivative of the vault or of the pressure acting on it.

Better than any other architectural member during the middle ages, the pier expresses the attempts and efforts of the architects and the logical results of the principles, that they adopted at the moment when the art came into the hands of the lay schools; thus we must enter into explanations sufficiently extended concerning the curious transformations, that the pier suffered from the 10 th to the 15 th centuries.

In the Roman basilica the pier is nothing but the column supporting a vertical wall, either by lintels or by arches. On two rows of columns rise two walls; on these two walls from one to the other extends carpentry. A vertical pressure, indeed quite weak, consequently a sufficient resistance if the columns were of hard stone, of granite or marble. Well built walls of brick are not heavy; carpentry, however wide, exerts only a very weak pressure. But when from the art of construction practised by the Romans, one falls into a coarse imitation





of that art, and when for thin and well bonded walls with excellent mortar and covered by indestructible plastering, or built of cut stones set with dry joints, one must substitute walls of roughed rubble badly bonded and filled with bad mortar; then it was necessary to give these walls a greater thickness and consequently a greater weight, and to the columns or piers a greater section. Besides, the Romanesque constructors during the Carolingian period could neither quarry nor cut monolithic columns of marble, granite or hard stone, they composed them of low courses of stone, and even sometimes of rubble. The reinforced piers did not always resist the loads imposed on them, they flushed and cracked; men increased their strength beyond measure to avoid accidents, and adopted rectangular sections; their courses were thus more easily set and were more resistant; frequently they were given a thickness much greater than that of the walls, whose weight they had to support.

Many monuments of the 10<sup>th</sup> and 11<sup>th</sup> centuries have retained piers in the construction of which are observed experiments, the attempts of constructors, rarely satisfied with the result obtained; for these piers were not only ungraceful and badly connected with the upper parts, but again they occupied a considerable area, encumbered interiors and obstructed circulation. Thus it is not rare to see in the same edifice piers built at the same time and taking different forms, as if the architects must try all, while in the impossibility of finding one that could satisfy them. During the 11<sup>th</sup> century we see simultaneously employed piers of square section, square with angles chamfered, round, lobed, square with attached semicircles, rectangular, circular surrounded by a series of sections of circles, etc.; but nothing is decided, nothing is definite, no system prevails.

In the little church of Vignory,<sup>1</sup> the walls of the nave are separated by a series of piers of rectangular section; then the last bay next the choir presents piers of round section. (Fig. 1). Above the pier of round section A is placed the form of false triforium B, a pier of square section with rounded angles.<sup>2</sup> The architect, mistrusting the smallness of his materials, did not dare to erect the piers of the nave to the height of the ceilings of the side aisles, but he stayed them





lengthwise by arches C (see section), that support the opening with no other purpose than to make the nave wall lighter and to decorate the interior. In the church of Bonnell-en-France, we see piers of the 11 th century, whose section is given at A (Fig. 2) supporting archivolts with double voussairs; but here appears the methodical spirit of the artists of Ile-de-France; the section of these piers is caused by the upper construction, and one feels the influence of a school whose principles are already reasoned. These piers are well built in regular courses. The mouldings are not returned on the faces, which is perfectly justified by the construction.

Note 1.p.152. From the 10 th to the 11 th centuries.

Note 2.p.152. See monograph of the church of Vignory made according to the drawings of M. Boeswillwald. (Archiv. des monhist. pub. sous les ausp. du ministre d'Etat.

In the nave of the church of S.Remi of Rheims, erected about the end of the 10 th century (we are speaking of the primitive constructions), are seen piers whose singular form appears to be without any motive. These piers (Fig. 3, 3 bis) consist of a cluster of segments of little columns, whose horizontal section gives the outline reproduced in Fig. 3. A circle having been drawn with radius A B, this circle is the plinth of the pier; having been divided into seven equal parts, there is obtained a polygon that gives the plinth of the bases of the little columns. The radius A B having been divided in two equal parts A C, B C, the points C then give the centres of the seven large columns. The intersections of the segments of these larger columns then give the centres of the seven other columns, the toruses of whose bases are tangent to the sides of the polygon. The archivolts H H, I I, of the face F G of the wall rest awkwardly on this pier, as easily seen by the drawing. The transverse arch K L of the side arch springs below that of the archivolts, which causes the abacuses of the capitals under that transverse arch to abut against the shaft of the pier, and the abacuses of the capitals bearing the archivolts penetrate the transverse arch. The perspective of this pier (Fig. 3 bis) further explains these eccentricities, and how all the capitals, except those bearing the transverse arches, are inscribed in a circle of the same diameter as that giving the horizontal projection of the plinth. It would seem





that the architect desired here to obtain a powerful resistance and a light appearance by these divisions of the great shaft in portions of intersecting cylinders.

In the church of S. Aubin of Guerande, the construction of the nave dates from about 1130, and rests on piers alternately cylindrical and compound. Here (Fig. 4) is one of the latter. The horizontal section traced at A gives four great half columns 2.0 ft. diameter and four thinner ones 1.3 ft. diameter. The bases of the columns are round and rest on a plinth also circular, enclosing the eight partial bases and forming a plinth. The horizontal projection of this plinth gives that of the abacus common to the eight capitals, bearing in front a pier of trapezoidal section, archivolts in two rows E, D, and a transverse arch on the side aisle. The pier C (see elevation F) only supports the tiebeams of the carpentry, this nave not having been vaulted originally. The construction of these piers is much better understood than that of the piers of the church of S. Remi of Rheims, for here each engaged column already has its distinct and well motivated foundation. The perspective sketch B explains the arrangement of the eight capitals grouped beneath the circular abacus.<sup>1</sup>

Note 1.p.156. These drawings were furnished to us by M. Gauthier).

The church of Lons-le-Saulnier shows us a nave of the 12 th century resting on piers alternately cylindrical and with a polygonal section, terminated by square endings forming capitals and receiving directly the imposts of the archivolts. (Fig. 5).

The 12 th century presents a great variety of piers. The constructors sought means to erect vaults over Romanesque naves, which until then had been habitually without them (at least in the provinces of the North), and passed from the cylindrical column to the square section, to a group of cylinders, to a square pier with engaged half columns, without finding a form definitely suited for these supports; for each day brought a new mode of construction of the vaults, and very often while the piers were built, there occurred an improvement in the manner of arranging the imposts, that could only be employed with difficulty on the piers prepared before the knowledge of the advance. That explains how many edifices of the 1

last horizontal series, and have similar results especially in  
 view, that evidently were not limited with respect to the  
 form of those values.

There is a second and somewhat similar series, the horizontal,  
 or rather the series of lines. There is some difference in the  
 last other one which were from the position of the line in  
 order, these series were really arranged in successive values  
 such as were observed in this second. The series of the series  
 of values, spread at the end of the line if it is generally an  
 interval the last years of the line, are already traced on a  
 line coinciding perfectly with the construction of the values.  
 They are formed by the intersection of the horizontal with the  
 four engaged half columns.

The series at a horizontal section of these series as  
 the level is 0, and 1 is their series at the level of 0. It is  
 the elevation of the line next the line, and 1 is the section  
 of the line between the ends of the horizontal. It is seen in  
 these series that the line of the line is not to have  
 the horizontal line already indicated to support the line series 1.  
 In this series the line series is not horizontal series, but  
 series 1 is not originally indicated as such, but that the  
 line, and that on the series 1 of the horizontal series of 1  
 the line series. There the series are placed at the series  
 of the horizontal and the horizontal series, as the series  
 of the series, the line series is not series 1 and series  
 series 1 and series 1 and 1. There the series are not  
 series of series, but series of the series to the series  
 line of the series is not. It is the series that series  
 is the arrangement. The series are placed for only one line  
 of, so as to leave in their series series series, which is  
 an important series, for every series series for all its series  
 effect, by the effect of series, never occurs in this series  
 series series. It is evident that is the series of series,  
 the series series from the series of the series is not series  
 series 1; the series series series series is the series  
 of the series and on the series series to series the series  
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last Romanesque period, one sees arches resting awkwardly on piers, that evidently were not designed with foresight of the form of those vaults.

There is a school that experiments little, the Burgundian, or rather the school of Cluny. Thus in those edifices due to that order one already sees from the beginning of the 12<sup>th</sup> century, appear piers very frankly arranged to receive vaults such as were conceived at that epoch. The piers of the abbey church of Vezelay, erected at the end of the 11<sup>th</sup> century and during the first years of the 12<sup>th</sup>, are already traced on a plan coinciding perfectly with the construction of the vaults. They are formed by the intersection of two rectangles with four engaged half columns.

Fig. 6 gives at A the horizontal section of these piers at the level a b, and B is their section at the level c d. C is the elevation of the pier next the nave, and D is the section of the bay through the middle of the archivolt. It is seen that above the band G, the wall of the nave recedes to leave the pilasters H already intended to support the side arches I, on which rest the groin vaults without diagonal arches. Buttresses K alone were originally intended to abut the great vaults, and rest on the imposts L of the transverse arches of the side aisles. Here the capitals are placed at the springings of the archivolt and the transverse arches, so that having the same diameters, the front engaged columns N are much longer than the columns M and O. Thus from that epoch the principle of subjecting the heights of the columns to the springings of the arches is adopted. It is the vaults that determine the arrangement. The columns are engaged for only one third, so as to leave to their diameters entire purity, which is an important point, for every column engaged for half its diameter, by the effect of perspective, never appears to have its actual thickness. It is evident that in the nave of Vezelay, the architect knew from the bottom of the edifice how he could vault it; the transverse arches rest fully on the projections of the capitals and on the square pier to which the columns are attached; the side arches of the great vaults find their points of support, and the groins of the vaults have their places in the reentrant angles, as in Roman construction.

The piers of the cathedral of Autun of a more recent epoch





(about 1140), but belonging to that beautiful school of upper Burgundy, likewise merit our attention. In horizontal section then consist of two intersecting rectangles with engaged fluted pilasters and not columns. It is necessary to note that the principal nave of this church has a true vault and not a cross vaults, as at Vezelay. Its piers are further arranged for this sort of construction. Section A is made on a b (Fig. 7), section B on c d and section C on e f. The transverse arches D rest on the top of the pilaster rising from the ground, and the rib that encloses it at the extrados rests on the little columns E. The lateral pilasters stop at the springings of the archivolt of the side aisles, and that behind receives at the same level the transverse arch of the side aisles. Then as at Vezelay the springings of the arches of the vaults determine the heights of the engaged columns or pilasters; but to not give the front pilaster a length out of proportion, the architect has taken care to cut it by the bands n and m. It is unnecessary to emphasize the study of proportions and of details that appears in this example of architecture. One would think that he saw there a fragment of those very delicate Greco-Roman monuments, that count M. de Vogue discovered in the vicinity of Antioch and Aleppo. It is not the sculpture that recalls that oriental school, so brilliant in the 5th century; and although the Gallo-Roman gates of Autun could inspire the architects of the cathedral of the 12th century with the motive of the arcade of the triforium, they certainly took elsewhere their mouldings and ornamentation, these mouldings and ornaments being of a style entirely different from that of the Gallo-Roman edifices, and of much superior execution.

This motive for piers has been followed in the construction of Notre Dame of Beaune, S. Andoche of Saulieu, and the cathedral of Langres, for the cathedral of Autun formed a school.

The school of Ile-de-France at the moment when architecture passed into the hands of lay architects, must break with these traditions, that seemed so well established in the provinces of Burgundy and of upper Champagne. About 1160 these architects of Ile-de-France attempted to combine the old Romanesque ideas with the new system that they introduced; they still retained the cylindrical column, and only commenced above those





columns the arrangement imposed by the cross vaults.

This principle is frankly emphasized in the interior of the cathedral of Paris. The piers of the choir of that church were erected about 1162, and those of the nave about 1200, and they present nearly the same arrangement. The piers of the choir, whose horizontal section we give (Fig. 3), consist of a great cylinder 4.3 ft. diameter supporting a wide capital with square abacus, on which rest the archivolts bearing the walls a b, c d, the transverse arches of the side aisle and the diagonal arches f. The three little columns g, h, h, extend to the springings of the great vaults to carry the transverse and diagonal or side arches. At the height of the triforium, the cylindrical section of the pier divides as indicated in the Fig. into as many members as there are vault ribs to be borne. In the nave (Fig. 9) the section of the pier of the triforium is simplified; the pier is built in courses and presents only square returns or pilasters, and the little columns are detached as monoliths. Later in the piers near the towers and about 1210, the constructors have even attached afterwards to the ground story an engaged column A to support the appearance of the overhang of the little front columns resting on the abacus, or rather to abut the great cylinder and prevent it from overturning. This was a transition.

See (Fig. 10) what is the construction of the piers of the nave of Notre Dame of Paris in elevation.<sup>1</sup> It is clear that the arrangement suited to the new system of construction then adopted only commences at the level A, i.e., above the abacus of the capitals of the columns of the ground story. Those form a separate arrangement, the lower pillars. This system persists longer in Ile-de-France than elsewhere, and the architects only abandoned it with difficulty. Yet already at Paris in the construction of the cathedral itself, they had erected in the side aisles of the nave cylindrical columns with attached attached round columns. (Art. Construction, Figs. 92, 93); but this system had been imposed on them by the necessity for giving at those points of support an exceptional resistance. We see that at the cathedral of Laon without any apparent reason, about the same epoch or about 1200, the architects added to the great cylinders of the ground story detached cylindrical columns, as an attempt or expedient, and start toward a new

(continued)

• (Lesjigend)

1. The first group of people who are interested in the results of the study are the researchers themselves. They want to know if the study was successful in achieving its objectives and if the results are consistent with their expectations.

[illegible]



system of construction of the piers. On 20 piers that bear the triforium of the vaults of the nave of Notre Dame of Laon, only four present that peculiarity of little columns placed at the angles of the front of the base, as indicated by the horizontal section (Fig. 11). The three little columns a, b, b, relieve the abacus of the great capital and receive the 5 little columns that support the transverse, diagonal and side arches of the great vaults. As for the little columns c, they receive the imposts of the diagonal arches of the vaults of the side aisles. In perspective, these piers present the appearance reproduced in Fig. 12. It is true that these 4 piers are placed beneath the springings of vaults, which at Laon as at Notre Dame of Paris comprise two bays, but it is not explained why this very good system was not preserved along the entire length of the nave. The bands A form a course connecting the upper shafts B with the lower shafts C. The constructors of the cathedral of Laon did not have the fine lias of Paris, and they could not cut conolithic shafts of great length. So they joined the shafts by these courses of bands repeated several times in the height of the piece, as seen at D. One will note that the capital of the great column comprises two courses, while capitals of the little columns standing on end are made in a single course in a single block with the second course of the great capital. This principle is followed quite rigorously during the first years of the 13th century. (Art. Chapiteau).

Note 1.p.162. Art. Gothedrale, plâs. 2, 4).

Some years before the construction of the cathedral of Laon, i.e., about 1170, there was erected in the same city the nave and choir of the church S. Martin, and the architect retained the body of the Romanesque pier, in horizontal section formed of intersecting rectangles with an engaged column next the great nave to receive the transverse arch; but in the 4 reentrant angles left by these rectangles the architect already set little columns on end to receive the diagonal arches of the upper and lower vaults. (Fig. 13). These little columns were composed of several pieces retained by bands as shown by the perspective view. But these piers had the inconvenience of giving a considerable section occupying much space, obstructing circulation, and restricting the view of the sanctuary;

[illegible]



yet those 4 little columns being arranged to receive the diagonal arches probably gave to the architects of the cathedral of Laon the idea of attaching to their cylindrical pier 5 little columns, one intended to bear the transverse arch of the great nave, and the four others to support the diagonal arches. Soon was adopted a more radical system, to the great cylindrical column were attached 4 engaged columns receiving the two transverse and the two archivolts; the diagonal arches and the side arch then rested on the great capital of the principal cylinder, and those of the vaults of the great nave on the little columns set on end and resting on the projection of the abacus. According to this system were erected the piers of the cathedral of Rheims (Fig. 14). At A we give the section of these piers at the level of the ground story, the great nave being on the side N. The great cylinders have a diameter of 5.25 ft.; in the direction of the cross section the piers are 8.13 ft. wide, and in the direction of the nave are only 7.87 ft. This precaution was taken to give these piers a little more bearing in the direction of the thrust of the vaults. The jointing of these piers is given by Villard of Honnecourt and is reproduced in our Fig. Villard of Honnecourt indeed takes care to tell us that this jointing was arranged to conceal the joints of the drums; it is unnecessary to add that the jointing alternates in each two courses. At the level of the triforium, at a b (see elevation B), the pier adopts the section C. The engaged column d is bonded with the structure, i.e., is built in courses, while the little columns receiving the diagonal arches of the great vaults, and the little columns receiving the side arches, are set on end, maintained by the bands g, h, that form rings, and the capitals i and l. The architect of Notre Dame of Rheims did not yet have a very definite theory of equilibrium of vaults in the great Gothic edifices, and he believed that he must give his piers a very strong section, at the level of the triforium, he thought that he must erect a great buttress with overhang to support the piers receiving the flying buttress. (Art. Cathedrale, Fig. 14). The architect of the cathedral of Amiens was bolder; he gave a much smaller section to his piers, and thought of maintaining them in a vertical plane only by the aid of the flying buttresses. (Art. Cathedrale, Fig. 20).





Other constructors have tried twin columns in the cathedrals of Sens and of Arras (section D; 1160), or later columns with a single engaged column (section 8), or again columns of oval section, as in the choir of the cathedral of Seez (end of 13th century; section F), as they were dominated by this idea of resisting the thrusts and of occupying the least area possible, not to obstruct the view of the naves and sanctuaries.

The examples of piers borrowed from the cathedrals of Rheims and Amiens only show us a great central column with 4 engaged columns; the little columns intended to bear the diagonal and side arches only spring above the lower capital. Already about the middle of the 13th century the little columns of the diagonal arches of the great vaults were extended down to the base itself of the pier; then soon it was desired to carry the diagonal arches and side arches on special shafts; the piers then assumed the section given by Fig. 15; A being the side facing the great nave and B the part of the pier with regard to the side aisle. From the instant that it was admitted, that the diagonal arches, like the archivolts and transverse arches, must have their little columns ascending from the ground, it was logical to admit that the side arches themselves should possess their vertical supports, and even that the members of these vaulted naves should each have their special point of support. Then were multiplied the little columns around the central cylinder, and the mouldings themselves of the arches came to die on the base of the pier. This system tended to suppress the capitals, for of what use is a capital as soon as the moulding forming the arch continues along the pier? Already about 1230, the little columns attached to the piers are no longer detached and monostylar, but belong to the same courses of the pier. In multiplying these little columns they become too slender to make it possible to cut them in a stone set on end, and even then it would have been very difficult without risking the breaking of the stones to cut out the reentrant angles with the chisel, the junctions of the little shafts with the nucleus, and these angles were rounded, as is shown in the section (Fig. 16). There resulted from that practical necessity a series of curved and soft surfaces, that only gave undecided shadows; it was necessary to find on those surfaces stops for light, that could accent the principal ribs.





The architects then had the idea of reserving on the front of each little shaft the edge that caught the light, and accented the projection of the cylindrical rib. (See A, Fig. 16). It resulted from the adoption of this principle, that the little shaft being engaged to the principal nucleus by a cove and having a projecting rib, it passed from the cylindrical form to the prismatic form.

From the end of the 13<sup>th</sup> century the school of Champagne, which from 1250 had taken the lead of the other Gothic schools, sought sections of piers that should be rigorously logical, i.e., that the clustered section should only have the arches supported by those piers. Then the section of the arches imperiously determined the sections of the piers, and to trace the pier it was necessary to commence by knowing and tracing the different members of the vaults.

The men that erected the church of S. Urbain of Troyes about 1290 took from that epoch the radical system that we have just indicated; but one will easily understand that the accepted form of the great cylindrical central pier could no longer accord with this new system, the combination into a cluster of all the ribs of the arches no longer being able to be resolved into a cylinder, even by joining to it additions, as done previously and as indicated in Figs. 15, 16. It was necessary to absolutely abandon the tradition of the great central column, which persisted until about the middle of the 13<sup>th</sup> century. Carried onward by the logical progress of their art, the constructors of S. Urbain did not hesitate, and we see that in the same edifice and during a very brief time, (ten years at most), they frankly reached the prismatic pier by suppressing the capitals.

Fig. 17 presents at A one of the 4 piers of the crossing. This pier bears two transverse arches B of the great vaults, two archivolts C of the side aisles, the branch D of the vault of the crossing, two members of the diagonal arches of the high vaults, and the branch E of the diagonal arch of the vault of the side aisle. Its plan takes the form given by the profiles of these 8 arches, and places the points of support vertically under the trace of the imposts of these arches. T The first pier of the nave, whose section is given at G, indicates likewise the horizontal projection of the imposts of





the archivolts B', of the diagonal arches E' of the great vaults, and of the diagonal arches E'' of the vaults of the side aisles, as well as those of the transverse arches H of the great vaults and I of the low vaults. Their piers also bear the capitals in a very low course, because the profiles of the arches of the vaults are identical with the sections of these piers. But the second pier of the nave gives the section K and is traced in such manner, that the archivolts L, the transverse arches H and I, the diagonal arches M exactly penetrate that section, the members a following at a', members b at b', c at c', d at d', etc. But not to weaken the pier by hollows, the copes, hollows and profiles meet the solid surface e', the sharp edges f of the rounds being marked on the pier by the edges f'. Hence the capitals are suppressed. A similar experiment, dating from the last years of the 13th century, does not fail to be of great interest, when one sees that also during the 14th century in the provinces of Ile-de-France and Normandy, men adhered to sections of piers not entirely marking the section of the arches of the vaults, and consequently requiring the use of the capital to separate the imposts from the group of little columns of the pier.

The church of S. Ouen of Rouen, whose choir dates from the 14th century, presents piers traced according to section G, i.e., that project with some modifications the transverse and diagonal arches of the vaults, and that still possess capitals; it is only at the end of the 14th and the beginning of the 15th centuries, that the method adopted by the architect of S. Urbain of Troyes is definitely accepted, and that the piers are only the combined and grouped projection of the different profiles of the arches. But since that method, however rational it was, required labor and consequently considerable expense, at that epoch men often returned to the cylindrical pier, into which then penetrated the profiles of the different arches of the vaults. Thus were constructed the piers of the lower church of Mt. S. Michel-en-Mer, and of a great number of edifices built from 1400 to 1500, particularly in civil structures, when it was claimed that useless expense was not incurred. However one should not lose sight of this fact, that from 1220 the French architects, renouncing the cylindrical column for supporting vaults, constantly sought to transform that column





into a support of the projecting members constituting the vault, and consequently into a vertical group of those members. The pier daily tended to become merely the continuation of the arches of the vaults, and we see that from the end of the 13<sup>th</sup> century, men had already arrived at that result. The pier being only a vertical cluster of the arches of the vaults, properly speaking, it was no longer a pier, but a group of arch mouldings descending vertically to the ground, i.e., the trace of the lower bed of the imposts that formed the horizontal section of the pier; and indeed this force is so important in vaulted edifices, we may say so imperious, that it must necessarily lead to this result. From 1220 Gothic architects could not erect a vaulted monument without previously tracing the plan of the vaults and of their imposts; it was very natural to regard this trace as the trace of the plan on the ground, and of placing these imposts on the base of its construction; this was a means of economizing drawings, and particularly for avoiding errors in location.

In civil architecture the piers assume forms that are no less the expressions of the necessities of construction, either when they bear vaults or they support the floors. Thus in the lower stories of the palace of the bishop of Meaux, stories that date from the end of the 12<sup>th</sup> century, we see piers placed in a row to carry the double vaults, and whose construction is quite remarkable. Here (Fig. 18) is their horizontal section at A and their elevation at B. The vaults have no transverse arches. These are cross vaults built like the Roman vaults, with a simple round in relief on the groins and an obtuse angle in the place ordinarily occupied by the transverse arch. (See section C made on a b). The pier consists of a principal cylindrical body with four cylindrical rounds (see section A); the piers are monolithic from the base to the astragal of the capital.

Houses of the city of Dol still possess monolithic piers of granite that date from the 13<sup>th</sup> century. They bear wooden girders and form porticos or side piers of shops. Here (Fig. 19) are two of those piers. At A is the section of the pier A and at B is that of pier B. Architects always sought with reason in cutting those isolated or engaged piers to avoid sharp angles, that break easily and are very troublesome. It





suffices to walk any day with the crowd in Rue de Rivoli at Paris. to recognize the inconveniences of the angles left on the isolated piers; they are so many injurious edges placed before passers. Admitting that this may be monumental, it is no less inconvenient.

The architects of the end of the 15 th century not only carried down the piers the prismatic profiles of the groins of the vaults, but they also sometimes pleased to twist them spirally and to decorate by carved ornaments the intervals left between the sides. One sees a curious pier cut thus at the back of the chevet of S. Severin at Paris. Also he sees one composed of great spiral rounds in the church of S. Croix of Provins. These are caprices that cannot serve as examples and that nothing justifies. The province of Normandy furnishes more than one of these oddities due to caprice of the artist, who at the end of his resources, seeks in his imagination combinations adapted to surprise the public. The masters of the middle ages never had recourse to such fantasies. Only in England from the 13 th century started this desire to produce surprising effects. Already in the cathedral of Lincoln are seen piers of that epoch, composed with a search for petty effects, that is only found much later in our school. Examples of piers are presented in Arts. Architecture Religieuse, Cathedrale, Construction and Travee.

#### PINACLE. Pinnacle. Terminal.

Grown or termination, as said in the 14 th century, of a buttress, a vertical support more or less decorated and ending in a cone or pyramid. In monuments of high antiquity, one already finds certain endings of the angles of pediments and of cornices, that are actual pinnacles.<sup>1</sup> Most of the monuments of our Romanesque period have lost nearly all the upper terminals that recall that antique tradition. Yet the ornaments in form of pine cones that terminate the lanterns of the church of S. Front of Perigueux, may pass for actual pinnacles. It is only in the 12 th century that one begins to note numerous remains of this sort of terminations. Then they surmount the angles of square towers at the bases of cones or pyramids forming the spire; they appear above the buttresses at the angles of gables. At first little developed or in form of little struct-





structures, from the end of the 12 th century they assume very great importance; then at the beginning of the 13 th century, they frequently become actual monuments. Like all architectural members of that time, pinnacles fulfil a function; they are destined to ensure the stability of vertical supports by their weight; they maintain the overhang of gargoyles and upper cornices; they prevent the sliding of the copings of gables; they serve for attaching balustrades; but also their outlines, always composed with infinite art, contribute to give to edifices a special elegance. Sometimes during the Romanesque period, these are very simple terminations. The buttresses of the 11 th and 12 th centuries, for example, in Beauvoisais, are often terminated at their tops by a cone rounded at the vertex. These cylindrical buttresses thus present termination reproduced in Figs. 1 and 2.<sup>1</sup>

Note 1.p.176. See the medal struck in the reign of Caracalla giving on the reverse the temple of Venus at Paphos (bronze); that giving on the reverse the temple of the Sun at Baalbec. Consult *Architectura numismatica*, collected by Donaldson, architect. (London. 1839).

Note 1.p.177. The pinnacle of Fig. 1 comes from one of the buttresses of the great church of S. George (12 th century). That of Fig. 2 is found on some edifices of Beauvoisais of the end of the 11 th century. The pinnacles crowning the cylindrical buttresses of the church of S. Remi of Rheims were terminated by analogous pinnacles. (11 th century).

The Collegiate of Poissy still retains on one of the angles of the stairway of the apse terminated by an octagonal pyramid, a pinnacle from the beginning of the 12 th century, and which we give a perspective drawing (Fig. 3). This pinnacle consists of four little columns supporting a group of capitals cut in the same course; a cone terminated by a cross-flower crowns the capitals. This pinnacle is very small, about 4.3 ft. high; it is found frequently adopted in the edifices of that epoch at the bases of the pyramids of spires. The old tower of Chartres has at the angles of the tower at the springing of the spire, pinnacles of beautiful composition, which at the same time serve as dormers (*Art. Fleche*, fig. 4); these date from the middle of the 12 th century).

The keeps of the castles also nearly always possessed their





pinnacles, probably from an early epoch, if one refers to vignettes of manuscripts and to the engraved representations of those edifices that remain to us. In the 13<sup>th</sup> century we again find some in place or in fragments. Sometimes even, as at the tower of Montbard, they are directly placed on the merlons of battlements. At the keep of Coucy they were four in number, built on the thick slope that covered the cornice of the upper defense. (Art. Donjon, Fig. 39). But the brilliant epoch of pinnacles is that when the architects began to erect flying buttresses to abut the great vaults of the naves of their churches. It was necessary on the buttresses receiving these flying buttresses to add a load, a vertical pressure intended to neutralize the oblique pressure of these arches, and to permit diminishing the horizontal section of the abutting piers. (Art. Construction). However powerful were these piers, the flying buttresses exerted their thrust near their tops, and if these tops were not loaded, could cause the last courses to slip. There was then necessary above the start of the arch a vertical load, a pressure. The architects of the lay school very quickly understood the benefit, that they could derive from this need, from the point of view of the decoration of edifices, and they did not hesitate to imagine the most beautiful and graceful combinations to satisfy this part of the programme imposed on constructors. They knew how to compose pinnacles, sometimes very simple for edifices built at small expense, sometimes very rich, but always understood in a remarkable fashion in outline and construction.

Among the most beautiful pinnacles that we possess in our French edifices of the 13<sup>th</sup> century, it is necessary to cite in the first line those terminating the buttresses of the cathedral of Rheims. These are actual masterpieces of composition and execution. One conceives how difficult it is to place little structures at the top of a monument, and to subject them to the scale adopted for the entirety. While giving an extreme elegance to these crownings, the architect of Notre Dame of Rheims knew how to place them in perfect harmony with the enormous masses near them, and that in accompanying them by colossal statues, which present along the entire length of the nave and choir a continuous series of grand motives filling the eyes, and causing to disappear whatever of thinness





there might be in these open and indented pyramids.

Here (Fig. 4) is a perspective drawing of these pinnacles. The calmness and simplicity of the composition have no need of comment to be appreciated; the sketches that we give, so far as they may be from the original, emphasize the essential qualities of the work. Note how in this purely decorative detail the architect has known how to avoid commonplaces. In the ornamental parts of the architecture, from the epoch of the Renaissance and more particularly in our days, men have so well known how to familiarize our eyes with what we term the botches of our art, that we have lost the feeling of what is true, of what is in its place, of what is decorated because of the place and the purpose. What do we see here in that immense ornamental appendage, that has no less than 78.7 ft. from the gargoyle to the upper cross-flower? 1, a pier or strong abutment, solid from A to B, intended to abut the thrust of the lower flying buttress, whose oblique pressure acts with more energy than the second; 2, from B to C an opened pier, sufficient to abut the thrust of the second flying buttress, on condition that this open pier is loaded by a considerable weight, that of the pyramid C D; 3, before the open part of the buttress are two monolithic columns, that stiffen the entire system of the structure, and beneath that open part intended to give lightness to that enormous pier is a sheltered statue, composed in such manner, that the lines of the wings break the uniformity of the vertical lines; 4, the weight of the pyramid is accented to the eyes by the four corbelled angle pyramids. In all that is nothing superfluous, nothing not justified or calculated. In all parts the construction is perfectly in accord with the decoration and the object; further a wise construction, in part contradicting the form.

The architects could not always dispose of resources so considerable, or allow themselves to erect before the buttresses or on their tops small structures of this relative importance. On the contrary, we frequently see that they are without the means for completing their work. At the cathedral of Chalons, the architect proceeded with evident economy. Thus the pinnacles terminating the buttresses of the nave (Fig. 5) are very far from presenting the richness and abundance of composition of those of Notre Dame of Rheims. They consist of a small pyr-





pyramid of octagonal section surmounting the head of the buttress ending in three gablets above the gargoyle receiving the water from the roof running in the channel A forming the coping of the flying buttress. Here the abutting pieces rise in one line to the level B; this pinnacle is no more than a simple crowning destined to cover this pier and to lighten its summit. Such a restricted programme being given, these pinnacles are skilfully treated, and it is difficult to pass from a massive base to a slender terminal with more skill.

The buttresses of the cathedral of Rouen above the chapels of the nave on the north side show beautiful pinnacles dating from about 1260. They consist (Fig. 6) of a little structure having in depth twice its width, the rear part is solid and reses as an abutment for the flying buttress, the front part is open and rests on two little columns. Beneath the canopy formed by the front gables is placed the statue of a king; the enclosing walls of the chapels are at A. Assured of the quality of the materials that they selected, and knowing how to employ them in accordance with that quality, the architects of that epoch did not recoil from this boldness. These pinnacles are now 600 years old, and certainly have not been maintained with much care, are still standing, and their slender columns support their canopies without having suffered alterations. One sees a pinnacle similar to these at the head of the first northern buttress of the choir of the cathedral of Paris, exceptionally rebuilt about 1260, and containing the grouped statues of the three Magi kings. Those of the abbey church of S. Denis erected at the heads of the flying buttresses in the reign of S. Louis, originally recalled this system; but they have been so disfigured by the restorations undertaken 25 years since, that one cannot recognize them. An octagonal turret surmounted the double bay of the gables.

The 14th century went farther in the matter of lightness in the composition of pinnacles. Those of the chapel of the Virgin of the cathedral of Rouen are of a slenderness, that makes them resemble articles of jewelry, and they seem rather executed in metal rather than in stone; it is true that the stone selected, that of Vernon, lends itself marvellously to these refinements.

As in all other members of Gothic architecture, the pinnac-





pinnacles adopt vertical lines by preference to horizontal lines, as they are more distant from the beginning of the 13<sup>th</sup> century. Thus (fig. 7) the pinnacles that terminate the buttresses of the *s-chapelle* of the palace at Paris sketched at A rest on the cornice that extends entirely around the edifice, and their gablets start from the horizontal slab and are placed on a coupe decorated by sunk panels. Those of the hall of the synod at Sens, built at the same epoch, i.e., about 1260, and all different, also accent the horizontal lines that intersect the verticals. At B we give that accompanying the statue of the king S. Louis, that represents a keep with portal closed by a portecullis, grated windows and turrets. The horizontal section of this pinnacle at the level c d is shown at B'. The pinnacles crowning the buttresses of the choir of *l'urh* S. Urbain of Troyes drawn at C, whose horizontal section at the level a b is sketched at C', have as a horizontal member only a band marked by the little lower pyramids. These pinnacles date from 1290. Finally, the great pinnacles that rest on the ends of the flying buttresses of the choir of the cathedral of Paris, represented at d and that date from 1300 scarcely accent the horizontal line. Likewise, the architect evidently desired to give to that important architectural member a slender appearance. The turret f attached to the principal body of the pinnacle, and that abut it, lead the eye to the point e of the summit by an almost unbroken line. These pinnacles are very skilfully composed and produce a grand effect. The channel t that serves as a coping for the flying buttress conducts the water through the sides of the upper turret into a great gargoyle placed at its base. These four pinnacles are drawn at the same scale.

In the 15<sup>th</sup> century the horizontal line not only no longer enters into the composition of pinnacles, but also these usually form a group of pyramids terminating in pyramids, intersecting and some extending above the others. Among the pinnacles of that epoch, whose execution is good, we shall cite their section made on a b, and at B some details quite remarkable in their execution.

The outline evidently occupied the architect authors of these conceptions, and it is certain that with rare exceptions, it is happy. These architectural members are almost always de-





detached against the sky, and we have indicated in other Articles (Arts. Clocher, Fleche) the difficulties presented by the composition of a terminal having the atmosphere for a background. In desiring to avoid meagreness one easily falls into the opposite excess; the least defect in proportion or in harmony of the details and the entirety shocks the least experienced eyes, destroys the scale and makes a spot; for the sky is a formidable background for architectural works; thus it is necessary to see with what care the architects of the middle ages have studied the parts of their edifices, whose outlines are free from anything in the vicinity, and how the architects of our time fear to expose their works outlined on the atmosphere. Several have declared that such boldness was in bad taste, that was an easy means of evading the difficulty, and yet nine times out of ten, monuments are detached in outline against the sky, for they rise above private structures, and are rarely in full light, especially in our climate. Indeed it is necessary to consider, that it is particularly in provinces situated north of the Loire, that pinnacles assume great importance and are studied with minute care.

The 16 th century also composed quite beautiful pinnacles, but which one cannot compare to those of the 15 th century in boldness, nor in harmony of details with the entirety of proportions. The pinnacles of the 16 th century are habitually badly joined to the part that they crown, and they are not connected with that marvellous skill, for example, that we admire in the composition of those around the choir of Notre Dame of Paris. These are works no longer belonging to architecture, little structures planted on the buttresses, without any connection with the building. They no longer fulfil their essential function, which is to ensure the stability of a point of support by a load acting vertically, they are ornamental appendages, the remains of a tradition, whose motive no longer is understood.

#### PISCINE. Piscina. Lavatory.

Bowls ordinarily constructed at the left of the altar (epistle side) in which the celebrant made his ablutions after communion. Dr. Grégoire<sup>1</sup> thus expresses himself on the subject of piscinas:— "There are two sorts of ablutions after the com-

munion, the first is east of the





communion, the first is that of the chalice, and the second is that of the hands or fingers of the celebrant. The deacon made that of the chalice, as appears from some old missals, and the priest washed his hands. This being for the third time before coming to the altar after the offering, and after the communion like the said Ratoldo, having washed his hands the third time. In the Roman order of Galet, the priest did not swallow the wine with which he washed his fingers, but poured it into the piscina. -- Yves of Chartres states that the priest washed his hands after the communion. Jean d' Arsonches orders that there be a special vessel in which the priest washes his hands after the communion. In the customs of Cîteaux, wine is placed in the chalice to purify it, and the priest goes to wash his fingers in the piscina, then he swallows the wine that was in the chalice, and takes some of it a second time to again purify the chalice.

Note 1.p.187. Les anciennes liturgies. Vol. 1.p.822. Paris. 1897.

I shall add that Leo IV, in a synodal oration to the priests, orders that there be two piscinas in each church, in the sacristies or near the altars:-- (Latin text). This was for washing the hands after the communion. Raterius, bishop of Ravenna in his instructions orders the same thing; S. Udalric (or Udalric) in the old customs of Cluny speaks of two piscinas; in one the chalice is purified, and in the other are washed the hands after the sacrifice; the deacon and subdeacon also wash their hands." Lebrun of Merettes in his Voyages liturgiques says, with regard to the practice at the cathedral of Rouen after communion:-- The priest after the communion makes no ablutions; but only while the ministrants at the altar communicate from the chalice, a sacolyte brings another vessel to wash the hands of the priest, as done today at Lyons, Chartres and among the cistercians, and as still done at Rouen before the last century, so that he was not obliged to rinse his fingers."<sup>1</sup> And further:--<sup>2</sup> "The last ablution with water and wine was not made then (in the 17th century), and the priest was not compelled to drink the rinsings of his fingers. He went to wash his hands at the piscina or lavatory, that was near the altar (the priest went to the lavatory). The same thing is marked in the missal of the Carmelites of the year





1574. And the ritual of Rouen desires that such may be near a all altars." William Durand <sup>3</sup> says that near the altar should be placed a piscina or a basin in which the hands are washed. Abbe Grosnier in the Note published in the Bulletin monumentale, <sup>4</sup> proposes these different questions, that he seeks to solve:- "1, has the priest always made ablution at the end of the service of the mass? Was the discipline of the Church uniform on that point until the 13 th century? 3, was it modified at that epoch, and who was the author of the modification? 4, What is the origin of the double piscina observed in nearly all the churches of the 13 th century? 5, has the custom of making ablutions been universal and without exception?" Until the 12 th century the priest washed his hands in the piscina at the end of the holy mysteries. We have just seen that according to an old custom of Rouen, the priest could make no ablution; that was poured into the piscina while the ministrants communicated under the form of wine.

Note 2. p. 187. Voyage liturgiques, by the Lord of mouléon. (Lebrun des Carottes). Paris. 1718).

Note 3. p. 187. This rinsing was probably cast into the piscina.

Note 4. p. 187. Rationel des divins offices. Book I. Chap. 29.

Yves of Chartres expresses himself thus on the subject of a ablutions:- "After having touched and taken the sacramental kinds, before turning toward the people, the priest must wash his hands, and the water is cast into a sacred place destined for that purpose." "Yet," says Abbe Grosnier, <sup>5</sup> "by respect to the holy kinds, already before the 13 th century, one finds in the religious orders the custom of making ablutions; it appeared inconvenient to pour into the same piscina the water that had served for washing the hands before the preface, and the liquid employed for cleaning the chalice and the fingers after the holy mysteries; thus one finds in the old customs of Cluny three ablutions made by the priests after the communion, one for the chalice and two for the hands."

Notes 4, 5. p. 188. 1849. Vol. V. of second series. p. 55.

Pope Innocent III having decided that the ablutions must be made by the priest; "it has been desired," adds Abbe Grosnier, "both to retain the ancient customs, and to take into account, if not the decision of the Pope, at least the motives that incited him. Two piscinas are established, one reserved for the





ablutions properly so called, and the other destined to receive only ordinary water."

Indeed, dating from the end of the 12 th century twin piscinas are seen to be adopted in the chapels of the cathedral and monastic churches, more rarely in the parish churches. The twin or single piscinas disappeared about the 15 th century, when the custom of drinking the ablutions was adopted in all churches.

Perhaps before the 12 th century, there were portable piscinas, metal basins placed near the altar, for it is only after that epoch, that the piscina is seen to form a part of the edifice, that it is foreseen in the construction, also the first piscinas appear to be extras, appendages not a cording with the architecture, while in the 13 th century the piscina is designed in the view of harmonizing with the entirety of the structure.

The apsidal chapels of the abbey of S. Denis, which date from Suger, have single piscinas in form of a basin attached to a pier. At the end of the 12 th century, in the chapels of the abbey church of Vezelay we see piscinas conceived after the same principle and that form an appendage. Here (Fig. 1) is one of them composed of a lobed bowl with orifice at the centre. The bowl rests on a group of little columns pierced vertically, so as to lose the water in the foundations. This was the custom generally adopted after the arrangement of the first piscinas, to lose the water under the ground itself of the church. Later the piscinas were furnished with gargoyles casting the water outside on the consecrated ground surrounding the churches. This piscina of Vezelay rests on the bench that extends around the chapel and receives the arcade; its bowl is alternately decorated on the exterior by flutes and rounds; the base, the group of the four little columns and the bowl are out in a single block of stone. In the church of Montreale, which dates from the same epoch, behind the main altar and in the same bench that receives the arcade, is hollowed the bowl of a piscina (Fig. 2) of a square form. Thus the bench serves as a shelf for depositing the vessels required during the ablutions. Later the piscinas assumed a certain importance, and were made in the form of niches made in the walls of choirs or chapels. The use of the piscina was thence-





thenceforth consecrated, the more because the single bowl was replaced by twin basins. One finds many piscinas of this kind from the end of the 12<sup>th</sup> century. They take the form of double niches separated by a little pier, and in the slab of which are hollowed two basins of square form, or more commonly circular, with an orifice at the centre leading into the foundations.

Many abbey churches of that epoch, of the orders of Cluny and of Cîteaux retain in their chapels piscinas so arranged. That which we give (Fig. 3) comes from the abbey of S. Jean-les-Bons-Hommes. A little isolated pier receives an impost bearing two round arches. There is seen at A a recess made for inserting a wooden shelf; at C is a recess terminated at the right end by an orifice. Perhaps that recess was intended to receive a hollow reed. Indeed Lebrun of the *variétés* in his *Voyages liturgiques*,<sup>1</sup> relates that still in his time, there was in the abbey church of Cluny a little altar at the left side of the great altar; that the little altar served for the communion in both kinds, which was practised on feasts and Sundays for some ministrants at the altar. He adds "that after the celebrant had taken the sacred host and a part of the blood, and he had communicated the host to the ministrants of the altar, they went to the little side altar; and the deacon having brought the chalice, accompanied by two candlesticks, he held the silver reed by the middle, the end being at the bottom of the chalice, and the ministrants of the altar, having one knee on a little upholstered bench, took and drank the precious blood through the reed. The same thing was practised at S. Denis in France on solemn days and Sundays. That little altar was called the Prothese."

"After the communion," says Boquillot, "the reed was placed in the ambry with the chalice; now the traces of fastenings visible in our Fig. 3 at B, indicate that an enclosure was arranged to close this piscina, which thus became an actual ambry; the chalice might have been placed on the shelf whose groove is seen at A. A little later near the piscina was often constructed an ambry. (Art. Armoire). Thenceforth it was unnecessary to close the piscina, thus we see that from the beginning of the 12<sup>th</sup> century, they are arranged to be open, although they most frequently may be arranged in twin niches.





Note 1.p.191. *Voyages littéraires*, by Lord Mouton. p. 149.

The pretty church of Villeneuve-le-Comte retains in the S. chapel a piscina of this kind very delicately composed. It consists of a niche separated in two parts by a pier, like the two jambs, cut from one block of stone. The twin arches are hollowed out of two stone slabs, the construction enclosing it around. The bowls are circular (see plan), and no trace indicates that this piscina was ever closed. The little detached columns are no more than 1.6 ins. diameter. One already sees by this example, that the architects of the 13 th century, once that the programme of the piscina was adopted, made it a motive of decoration; in fact they admitted that a need or requirement might become the object of a special study, and consequently a means of ornamenting the edifice. We shall seek today to disguise this appendage in order not to oppose the lines of the beautiful architecture; our ancestors on the contrary caused it to appear frankly, although it was never on an axis, and decorated it with care. The chapels of the cathedral of Amiens, erected about 1240, possess beautiful piscinas placed in the arcade forming the substructure; treated with a particular care, these principles are placed at the left of the altar (epistle side) according to custom. On the side opposite is constructed an ambry.

We give (Fig. 5) a perspective of the entirety of one of these piscinas with the arcade accompanying and enclosing it. Fig. 5 bis gives its plan. As one sees by the plan, the little columns of the arcade are independent of the piscina, which is made at the expense of the thickness of the wall of the substructure. The orifices of the two basins are lost in the foundations, those piscinas having no external gargoyles.

The S. Chapelle of the palace at Paris likewise presents at the left of the main altar a very beautiful piscina with double bowl, with a credence above divided in four compartments. This piscina is engraved in the monograph of the S. Chapelle published by M. Calliat;<sup>1</sup> like that just given it combines with the arcade forming the decoration of the substructure of the chapel. Opposite at the right of the altar is a double ambry.

Note 1.p.193. Bonce. Paris. 1858.

Sometimes, but very rarely in the churches of the 13 th century, the piscinas are made in the form of basins set on a p





pedestal, like those of Vezelay. We shall cite those of the chapels of the choir of the cathedral of Sees (end of the 13<sup>th</sup> century), a sketch of which we give (Fig. 6). Here the two bowls do not have the same form, one being polygonal and the other round, they rest on a group of leafy branches, and are placed in the openings of the arcade. The clusters of branches spring from the continuous bench serving as a base for that arcade.<sup>1</sup>

Note 1. p. 19. There is always a bench before the piscinas.

The piscinas of the chapels of the 13<sup>th</sup> and 14<sup>th</sup> centuries of the cathedral of Paris are very simple, and only consist of a small lobed niche on two little engaged columns; or falling on the slab by a chamfer. All these piscinas have gargoyles on the exterior. The piscinas of the chapels of the choir of the cathedral of Rheims were closed by wooden shutters and at the same time served as ambries.

The 14<sup>th</sup> century made very delicate piscinas, richly carved. We shall cite among the most remarkable those of the choir of the church of S. Urbain of Troyes.<sup>2</sup> It contains two bowls separated by a middle pier and terminated by two gables decorated by being crowned by the Holy Virgin and by two little figures of the two givers, Pope Urbain IV and cardinal Aucher. Two canopies treated artistically crown these little figures and are surmounted by merlons between which appear archers serving to defend the little structure. This piscina is very well engraved in the *Annales archæologiques*,<sup>1</sup> after a drawing of M. de Boeswilwald, and we believe there is nothing better than to send our readers to that reproduction and to the Note of M. Didron accompanying it. The piscina of S. Urbain is not the only one crowned by crenelations; we will cite also those of the apsidal chapels of Semur-en-Auxois, that are sixty years earlier than those of S. Urbain, and are likewise crenelated at top.<sup>2</sup> Piscinas became rare in the 15<sup>th</sup> century, probably because the custom of drinking the ablutions was generally adopted. Still we find some examples of them, but the double bowls are no longer used. In one of the lateral chapels of the church of Semur-en-Auxois exists a pretty piscina of the 15<sup>th</sup> century that we give here (Fig. 7). The bowl is supported on a little column, and in the niche made over it is a little shelf for placing the vessels. A very rich canopy surmounts





the whole. At A we give the section of this piscina on a b' at B on c d. One further sees in the French churches of the 13 th and 14 th centuries a prodigious number of piscinas entirely varied in the form of a charming composition. In these accessories can be observed the singular fertility of the architects of this epoch. They very rarely reproduce even a remarkable example; with a collection of piscinas, one would make an entire work furnishing compositions infinitely varied for the same object.

Note 2.p.195. This piscina dates from the last years of the 13 th century, but by its ornamentation belongs to the 14 th century. We have several times had occasion to state that the church of S. Urbain of Troyes is at least 25 years in advance of the architecture of Ile-de-France.

Note 1.p.196. Volume VII. p. 36.

Note 2.p.196. One of these piscinas was engraved in *Annales archéologiques*. Vol. IV. p.87. These piscinas have a single bowl. In the lateral chapel of the church of S. Thibout is also seen a piscina of the 14 th century with a single bowl, crowned by a crenelated canopy.

#### PLAFOND. Ceiling.

What we term ceiling today in our structures, i.e., those level beams lathed and plastered beneath so as to present a plane surface, did not exist, because the ceiling was only the appearance of the real construction of the floor, composed of visible girders and beams, more or less richly moulded and even carved. These ceilings thus show projecting and recessed parts, sometimes forming coffers or panels, that were decorated by mouldings and paintings. There remain in France no ceilings earlier than in the 14 th century, although we know perfectly that some existed before that epoch, since they made floors that were not plastered underneath. The plastering applied on laths under the floors indeed have the serious inconvenience of depriving the wood of the air necessary for its preservation, of heating it and causing decay. Wood left in dry air can exist for centuries, enclosed in a layer of plaster, especially if not entirely dry, heats and ferments, and is reduced to dust. We do not think it necessary to insist on this fact so well known to practitioners.<sup>1</sup>

Vote 1. p. 198. On the contrary, the use of floors in front of  
 the the ceiling in the middle area was only the floor; and  
 the ceiling of the floor was not the ceiling of the  
 ceiling; the idea never came to the masters of that epoch to  
 cover the underside of a floor by vaults, panels and coffers  
 of wood or plaster with no relation to the construction given  
 by the wall construction. It would have been difficult to trace  
 at the ceiling of the middle area without finding traces  
 of the floor, since one is the continuation of the other, and  
 we shall combine these two articles in a single one.

It was common with artists, if ceilings and walls were painted  
 a distance of 4.5 ft. or 5.5 ft., and were decorated by simple  
 lines with some painting in a whole projection, in order to give  
 the impression of a whole space with some first object  
 figures with vertical columns of supporting the weight of the  
 floor, some panels with lines or other elements. This method was  
 adopted in many countries and it was followed until the 18th  
 century. When the artists had very great means, as occurred  
 but rarely, the taste of painting on either wall, or ceiling  
 panel heading under the weight of the joists. It is clear that  
 such floors would occupy much height, but our ancestors did  
 not fear the projections of girders, and even restricted them as  
 a means of decoration.

The girders (Fig. 1) generally had little bearing in the  
 walls, but were relieved by some simple projection over the  
 floor. It seems that the walls were ornamented by moldings of stone  
 or plaster, some only supporting weight and some resting on the  
 ceiling. In the latter figure, the joists rest only on the  
 of the floor, as shown at B; the other is in a wall or beam  
 in the wall, in holes, or on a wall beam C, which is itself  
 placed on little columns or on a continuous molding. It is  
 frequently shown that these joists are, being held together by  
 beams not by nails, so that one slight shock would destroy them  
 on the floor and the wall beam, and like walls and floors of  
 Italy. This means of relief is still seen in some of the  
 the spaces between the joists were apparently filled with  
 left hand, were decorated in plaster, or indeed with wall cov-  
 ered by boards or panels of plaster. The joists of these combs  
 were made of beams B, which formed the main floor beams



Note 1.p.198. On the contrary, the use of floors in iron justifies the adoption of plane and plastered surfaces underneath.

Then the ceiling in the middle ages was only the floor; the construction of the floor gave the form and appearance of the ceiling; the idea never came to the masters of that epoch to cover the underside of a floor by vaults, panels and coffers of wood or plaster with no relation to the combination given by the real construction. It would thus be difficult to treat of the ceilings of the middle ages without likewise treating of the floors, since one is the consequence of the other; so we shall combine these two Articles in a single one.

If the rooms were narrow, if between the walls existed only a distance of 6.6 ft. or 9.8 ft, men were contented by simple joists with ends resting on a stone projection, in holes or on wall beams; but if the room were wide there were first placed girders with strength capable of supporting the weight of the floor, then joists were laid on those girders. This method was adopted in Roman antiquity and it was followed until in the 16th century. When the girders had very great spans, they did not commit the fault of trussing to stiffen them, to prevent their bending under the weight of the joists. It is clear that such floors would occupy much height; but our ancestors did not fear the projections of girders, and even regarded them as a means of decoration.

The girders (Fig. 1) generally had little bearing in the walls, but were relieved by stone corbels projecting more or less. If these girders were ornamented by mouldings on their angles, these only appeared beyond the part resting on the corbels. In the oldest floors, the joists rest only one end on the girder, as shown at B; the other is in a recess made in the wall, in holes, or on a wall beam C, which is itself placed on little corbels or on a continuous moulding. As it frequently occurs that these joists tip, being held neither by tenons nor by pins, so that one places blocks E between them on the girder and the wall beam, cut like keys and pinned obliquely. This means greatly stiffens the joists and girder. The spaces between the joists were anciently filled solid or left open, were plastered on boards, or indeed were well covered by boards G running crosswise. The joints of these boards were masked by battens H, which formed as many little panels





between the joists. On these boards was laid a surface of plaster or mortar and then the tiles K. The wood of these ceilings rarely remained visible; it was generally covered by distemper painting, that could easily be renewed. One still sees a good number of those ceilings of the 13<sup>th</sup> and 14<sup>th</sup> centuries under more modern laths in old houses. Sometimes the girders and the joists themselves were delicately moulded.

This system of floors employed a great quantity of wood and required joists of large dimensions; for as we have already stated, these joists were as often set solid as spaced apart; they lent themselves perfectly to covering long rooms, great corridors and galleries, but for chambers, rooms nearly square, it did not offer <sup>the</sup> stiffness, that was sought in rooms must occupied and furnished with heavy furniture. Thus in the 14<sup>th</sup> century men endeavored to replace this so simple a system by another with a more pleasing effect, presenting more stiffness. Thus (Fig. 2) a hall being given, whose quarter is traced in A B C D, two principal girders E were placed. Four lines of beams F formed cross beams and were framed into those girders, and joists G were likewise framed into the beams. At H we give the section of this floor made on a b. The beams rest at the walls on corbels I, the wall beams K are set in a recess, fill the intervals between the beams and receive the ends of the joists. The junctions of the timbers of this ceiling are sketched at L. The girder is profiled at P with the support of the beams at M. Those at N have a dovetail tenon that fits in the gain M, and gains R receive the dovetail tenons S of the joists. Planks 1.5 ins. thick were placed on the joists and held by rebated stops T. This system of dovetailed joints gave much stiffness to the floor, prevented the separation and housing of the timbers. The moulded beams formed a series of panels of very rich and pleasing appearance. We have seen ceilings so constructed in the houses of the little cities of S. Antonin and of Cordes, that have suffered no alteration. These ceilings in beautiful oak or even fir, were never decorated by painting and present woodwork of a beautiful color. Not content with decorating them by mouldings, the architects then enriched them by carvings. There exists in a house at No. 1, Rue du Marc at Rheims a magnificent ceiling in carved wood of the 15<sup>th</sup> century, conceived on this principle, and which is

the ends of the beams.

Note I. p. 205. M. Thonet, architect of Vienna, was very willing to draw this calling for us with the greatest care.

[illegible][illegible]



as much a work of joinery<sup>1</sup> as of carpentry. It covers a hall 49.2 ft. long by 21.3 ft. wide, and is divided in 5 bays separated by 6 girders, the two end ones forming wall beams. Fig. 3 gives a part of one of these bays, the entire ceiling being sketched at A. Between the girders P are placed the beams S with tenons at their ends. The beams are stiffened by the cross beams E. Panels B fill the intervals. These panels are decorated by (forms of) folded parchments. The girders are carved on their sides and beneath; corbels are placed under the ends of the beams.

Note 1.p.202. M. Thienet, architect at Rheims, was very willing to draw this ceiling for us with the greatest care.

Details are necessary to explain the connections and decoration of this ceiling; we give them in Fig. 4. At A is drawn the half section of the girders; the dotted line a indicates the span of the beam B. The corbels C have their abacuses fixed at b under that span. The cross beams D stop at the beams as indicated by the perspective sketch D'; a slightly inclined shoulder E receives their ends. At G we give a section of the beams with the end of the girder near its span. Assuming the beams removed, the girder presents the sketch H. Thus one sees that the corbels are independent and allow the passage behind their bottom, of the mouldings sculptured on the girders. This detail explains very well how the ceiling, partly carpentry and partly joinery, presents stiffness; its appearance is pleasing without attracting the eyes too much, which is important, for the architects of the middle ages and even those of the Renaissance did not yet think of those compositions, majestic in some eyes, grotesque in those of others, by which were covered the ceilings after the 17<sup>th</sup> century, compositions that on the whole are nothing but plastering on laths, painted and gilded, fastened by iron cramps, appearances masking great poverty of means beneath a covering of applied casts, simulating marble and bronze, sometimes even tapestries!

In the construction of their floors and consequently of their ceilings, the masters of the middle ages were always truthful; they exhibited and adorned the construction. We think that there was more merit in that, than to deceive shamelessly in the elementary principles of construction. They first occu-





occupied themselves with the combinations of timbers in carpentry, they sought to ornament them according to that combination.

In the southern provinces of France were also employed ceilings applied and nailed on the beams; i.e., beneath the joists were nailed boards, on those boards being fixed mouldings forming panels decorated by paintings. This sort of ceilings was very rich, and at the same time presented the lightness that the eye likes to find in the upper parts of a room. This procedure was again employed during the Renaissance, and the ceiling of the gallery of Francis I at Fontainebleau gives a charming example of it.<sup>1</sup>

Note 1.p.204. This ceiling has unfortunately been repaired. We speak of that which existed before 1843. At Venice are still seen beautiful ceilings executed on this system. One likewise finds such in Spain and especially at Toledo. The mansions of Toulouse presented some of them a few years since.

Our century is a little too strongly permeated by the conviction, that it invents daily, does not doubt that ceilings composed of brick vaults set on wooden timbers or iron beams are an innovation; now here is (Fig. 5 at A) a ceiling placed in a house built at the end of the 15th century at Chartres, Rue S. Pere, which gives us a combination of this kind. The beams B are set on an angle and fixed in the walls, on their flat sides b are turned brick vaults set diagonally. These bricks are 1.64 x 3.23 ins. The spandrels C are filled by masonry on which rests the tiles d. The beams are 1.05 ft. square, and being set diagonally, present great stiffness. This ceiling of very small span produces a very good effect, and can easily be decorated and kept clean. At Troyes in <sup>the</sup> mansion of the Eagle, called du Mauroy, Rue de la Trinite, exists a ceiling of the 15th century entirely of wood (see sketch G), which presents beams E set diagonally according to Fig. 5. In the reentrant angles formed by these adjacent beams are nailed triangular strips I, and then across all the planks K. These beams are framed into girders, whose half section we give at L. Sometimes the salient angles of these beams are chamfered, which gives the ceiling an uncommonly light appearance. The fashion of the majestic (for the majestic is one of the most permanent fashions in this country, that changes them so fre-





freely) has destroyed or covered with laths many of these ceilings of the middle ages or the Renaissance. It is necessary to follow the demolitions of our oldest mansions to discover under the plastering combinations often very ingenious. Thus for example, at the demolition of mansion de la Tremouille at Paris, we saw under the laths covered by plaster mouldings on beams very delicately wrought, set on girders and forming a series of graceful panels. That was a combination analogous to that given in Fig. 3, except that the cross beams were connected at one-third the depth of the beams and left spaces perfectly square. Each interval was filled by a panel carved in arabesques; the whole had been painted and gilded. England is more conservative than we are in regard to its old edifices, (which does not prevent it from being at the head of progressive ideas), and still possesses beautiful ceilings of the 15th and 16th centuries, in moulded and carved wood. If the spans of the girders were very great, they were often trussed, i.e., composed of two tiebeams holding two inclined timbers, or surmounted by two actual principals included in the depth of the joists and tile floors. Stirrups of wrought iron suspended the girder from the two principals; these stirrups contributed to the decoration of the girder, and the mouldings cut on the visible angles stopped at the ironwork. One frequently sees ceilings thus represented in vignettes of manuscripts of the 15th century.

Since one wearies of everything, even of things justified neither by reason nor by taste, we can hope to see abandoned some day the heavy ceilings with coves and great coffers, with figures in the round and with draperies mingled with garlands and vases, so much in vogue since the reign of Louis XIV, the return of ceilings whose forms will be indicated by the construction, whether in wood or iron.

It must be stated here that from the 15th century, between the beams of floors were frequently made deafenings of plaster laid on boards placed on strips nailed at two-thirds the depth of the beams, both to prevent the dust from sifting through between the tongues of the covering floor, as well as to avoid transmission of sound through floors entirely of wood. These deafenings were painted and even sometimes were decorated by plaster reliefs. One sees some ceilings of this

that in all cases of interior work the floor is laid  
 a board, and the walls are built on the ground and  
 formed also in plaster, in which was placed the wall or even  
 even intended to receive the tile floor.

### CHAPTER IV. THE TEMPLE OF KARNAK.

The temple of Karnak is situated on the east bank of the Nile  
 a distance of about two miles from the city, being a  
 vast collection of temples, the architecture of the middle  
 ages scarcely employed is more than the Greeks. The Greeks  
 did not accept the arch, and if they had to cover a space  
 between two piers, piers or columns, they placed on these ver-  
 tical beams of wood or stone, and the beams were joined by  
 cords the same in most cases, although they had already join-  
 ed lintels, and this had made actual piers. With rare ex-  
 ceptions, however, in the temple of Karnak, the arch  
 is used in the middle ages always to support the lintel composed  
 of various. If the temple is a palace, they placed a relieving  
 arch over it. It was less common, and was placed in the sub-  
 stratum of private edifices as many distances as were possible  
 or days covered horizontally; only we take care to support it  
 that various joining by means of strong iron bars.  
 Then why not employ masonry? But we omit the reason here  
 again of the abundance of our grand monuments, like the colun-  
 nade of the Greeks, the temple of Karnak, the temple of  
 Karnak, whose various are found on iron bars supported by ti-  
 es from the lower stones. The masonry that the architects  
 of the middle ages could not force themselves to resist in  
 that form on the ground of the most natural principles of con-  
 struction, and that it is for that, that several men regard  
 them as artists of genius.

### CHAPTER V. THE TEMPLE OF KARNAK.

Gysemus burned in a furnace, ground fine and combined with  
 ly with water to form a solid, hard and tolerably durable  
 a very poor conductor of heat.  
 It is a material of which the ancient Egyptians made  
 used it not as plaster. On the contrary, this material was  
 not only placed in private structures but also in public  
 edifices. Indeed plaster is an excellent material, and ques-



kind in old houses of Orleans. Above the deafenings was left a space, then boards were laid on the joists and troughs were formed also in plaster, in which was placed the marl or even earth intended to receive the tile floor.

PLATE - BANDE. Platband. Horizontal Arch. Lintel.

~~This is a lintel jointed in voussoirs.~~ The platband or combination of stones placed horizontally on two jambs, being a vicious principle in jointing, the architects of the middle ages scarcely employed it more than the Greeks. The Greeks did not accept the arch, and if they had to cover a space between two piers, jambs or columns, they placed on these vertical points of support a horizontal monolith. The Romans proceeded the same in most cases, although they had already jointed lintels, and thus had made actual platbands. With rare exceptions mentioned in Arts a construction and Fenetre, the architects of the middle ages always rejected the lintel composed of voussoirs. If they feared a rupture, they turned a relieving arch over it. We are less scrupulous, and we place in our public or private edifices as many platbands as there openings or bays covered horizontally; only we take care to support that vicious jointing by means of strong iron bars.

Then why not employ monoliths? Let us omit the mention here again of the platbands of our grand monuments, like the colonnade of the Louvre, the Garde-Meuble, Madeleine and the Pantheon, whose voussoirs are strung on iron bars suspended by ties from the upper arches. One understands that the architects of the middle ages could not force themselves to falsify in that fashion the truest of the most natural principles of combinations; and that it is for that, that several men regard them as artless persons.

PLATRE. Plaster. Plaster of Paris.

Gypsum burned in a furnace, ground fine and combining rapidly with water to form a solid, light and tolerably hard body, a very poor conductor of heat.

It is a prejudice to believe that the constructors of middle ages did not use plaster. On the contrary, this material was not only adopted in private structures but also in public edifices. Indeed plaster is an excellent material, the quest-

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1960-1961 Winter season - 100 days, 100 nights, 100 miles

Individuals born between 1940 and 1949 are the least likely to be in the labor force, with 60.3% of the population aged 15 and over in the labor force. The labor force participation rate for the 1950-1959 age group is 66.3%, and for the 1960-1969 age group is 70.3%. The labor force participation rate for the 1970-1979 age group is 74.3%, and for the 1980-1989 age group is 78.3%. The labor force participation rate for the 1990-1999 age group is 82.3%, and for the 2000-2009 age group is 86.3%. The labor force participation rate for the 2010-2019 age group is 89.3%, and for the 2020-2029 age group is 91.3%.

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at that it was in the liquid state. On the contrary, as the

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FIG. 1. (a) Schematic of the experimental setup. (b) Schematic of the experimental setup.

is able to produce an all-inclusive policy

File of (series area view of source) and other related files

It is a pleasure to have you here today.

cc: Mr. Tolson, Mr. Boardman, Mr. Nichols, Mr. Belmont, Mr. Ladd, Mr. Clegg, Mr. Glavin, Mr. Harbo, Mr. Rosen, Mr. Tracy, Mr. Egan, Mr. Gurnea, Mr. Hendon, Mr. Pennington, Mr. Quinn, Mr. Nease, Mr. Gandy

more a few hundred feet away from the road as shown on the map.

1990-1991 1991-1992 1992-1993 1993-1994 1994-1995 1995-1996 1996-1997 1997-1998 1998-1999 1999-2000 2000-2001 2001-2002 2002-2003 2003-2004 2004-2005 2005-2006 2006-2007 2007-2008 2008-2009 2009-2010 2010-2011 2011-2012 2012-2013 2013-2014 2014-2015 2015-2016 2016-2017 2017-2018 2018-2019 2019-2020 2020-2021 2021-2022 2022-2023 2023-2024 2024-2025 2025-2026 2026-2027 2027-2028 2028-2029 2029-2030 2030-2031 2031-2032 2032-2033 2033-2034 2034-2035 2035-2036 2036-2037 2037-2038 2038-2039 2039-2040 2040-2041 2041-2042 2042-2043 2043-2044 2044-2045 2045-2046 2046-2047 2047-2048 2048-2049 2049-2050 2050-2051 2051-2052 2052-2053 2053-2054 2054-2055 2055-2056 2056-2057 2057-2058 2058-2059 2059-2060 2060-2061 2061-2062 2062-2063 2063-2064 2064-2065 2065-2066 2066-2067 2067-2068 2068-2069 2069-2070 2070-2071 2071-2072 2072-2073 2073-2074 2074-2075 2075-2076 2076-2077 2077-2078 2078-2079 2079-2080 2080-2081 2081-2082 2082-2083 2083-2084 2084-2085 2085-2086 2086-2087 2087-2088 2088-2089 2089-2090 2090-2091 2091-2092 2092-2093 2093-2094 2094-2095 2095-2096 2096-2097 2097-2098 2098-2099 2099-2100 2100-2101 2101-2102 2102-2103 2103-2104 2104-2105 2105-2106 2106-2107 2107-2108 2108-2109 2109-2110 2110-2111 2111-2112 2112-2113 2113-2114 2114-2115 2115-2116 2116-2117 2117-2118 2118-2119 2119-2120 2120-2121 2121-2122 2122-2123 2123-2124 2124-2125 2125-2126 2126-2127 2127-2128 2128-2129 2129-2130 2130-2131 2131-2132 2132-2133 2133-2134 2134-2135 2135-2136 2136-2137 2137-2138 2138-2139 2139-2140 2140-2141 2141-2142 2142-2143 2143-2144 2144-2145 2145-2146 2146-2147 2147-2148 2148-2149 2149-2150 2150-2151 2151-2152 2152-2153 2153-2154 2154-2155 2155-2156 2156-2157 2157-2158 2158-2159 2159-2160 2160-2161 2161-2162 2162-2163 2163-2164 2164-2165 2165-2166 2166-2167 2167-2168 2168-2169 2169-2170 2170-2171 2171-2172 2172-2173 2173-2174 2174-2175 2175-2176 2176-2177 2177-2178 2178-2179 2179-2180 2180-2181 2181-2182 2182-2183 2183-2184 2184-2185 2185-2186 2186-2187 2187-2188 2188-2189 2189-2190 2190-2191 2191-2192 2192-2193 2193-2194 2194-2195 2195-2196 2196-2197 2197-2198 2198-2199 2199-2200 2200-2201 2201-2202 2202-2203 2203-2204 2204-2205 2205-2206 2206-2207 2207-2208 2208-2209 2209-2210 2210-2211 2211-2212 2212-2213 2213-2214 2214-2215 2215-2216 2216-2217 2217-2218 2218-2219 2219-2220 2220-2221 2221-2222 2222-2223 2223-2224 2224-2225 2225-2226 2226-2227 2227-2228 2228-2229 2229-2230 2230-2231 2231-2232 2232-2233 2233-2234 2234-2235 2235-2236 2236-2237 2237-2238 2238-2239 2239-2240 2240-2241 2241-2242 2242-2243 2243-2244 2244-2245 2245-2246 2246-2247 2247-2248 2248-2249 2249-2250 2250-2251 2251-2252 2252-2253 2253-2254 2254-2255 2255-2256 2256-2257 2257-2258 2258-2259 2259-2260 2260-2261 2261-2262 2262-2263 2263-2264 2264-2265 2265-2266 2266-2267 2267-2268 2268-2269 2269-2270 2270-2271 2271-2272 2272-2273 2273-2274 2274-2275 2275-2276 2276-2277 2277-2278 2278-2279 2279-2280 2280-2281 2281-2282 2282-2283 2283-2284 2284-2285 2285-2286 2286-2287 2287-2288 2288-2289 2289-2290 2290-2291 2291-2292 2292-2293 2293-2294 2294-2295 2295-2296 2296-2297 2297-2298 2298-2299 2299-2300 2300-2301 2301-2302 2302-2303 2303-2304 2304-2305 2305-2306 2306-2307 2307-2308 2308-2309 2309-2310 2310-2311 2311-2312 2312-2313 2313-2314 2314-2315 2315-2316 2316-2317 2317-2318 2318-2319 2319-2320 2320-2321 2321-2322 2322-2323 2323-2324 2324-2325 2325-2326 2326-2327 2327-2328 2328-2329 2329-2330 2330-2331 2331-2332 2332-2333 2333-2334 2334-2335 2335-2336 2336-2337 2337-2338 2338-2339 2339-2340 2340-2341 2341-2342 2342-2343 2343-2344 2344-2345 2345-2346 2346-2347 2347-2348 2348-2349 2349-2350 2350-2351 2351-2352 2352-2353 2353-2354 2354-2355 2355-2356 2356-2357 2357-2358 2358-2359 2359-2360 2360-2361 2361-2362 2362-2363 2363-2364 2364-2365 2365-2366 2366-2367 2367-2368 2368-2369 2369-2370 2370-2371 2371-2372 2372-2373 2373-2374 2374-2375 2375-2376 2376-2377 2377-2378 2378-2379 2379-2380 2380-2381 2381-2382 2382-2383 2383-2384 2384-2385 2385-2386 2386-2387 2387-2388 2388-2389 2389-2390 2390-2391 2391-2392 2392-2393 2393-2394 2394-2395 2395-2396 2396-2397 2397-2398 2398-2399 2399

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cover the floor areas, the panels of half timber work, for car-

also, to form connections. Most will connect

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later. We have seen something even wilder from the past

another with plaster property. In the palace of the archbishop

or otherwise, and the results of the investigation shall be reported to the committee.

a little loss when it is exposed to the weather.



question being to employ it properly.

Pure plaster being mixed with a proper quantity of water, as soon as it begins to set (which occurs almost immediately after mixing, swells and assumes a volume considerably greater than it had in the liquid state. On the contrary, as the water evaporates and when it dries, it loses in volume. One understands that this shrinkage may be dangerous in some cases and produce settlements. So the constructors of the middle ages never employed plaster in the large masonry, in what we now term rough walls, nor (except in very rare cases) to fill beds of joints of stones. They always set their courses of stones on a bed of mortar, and for their concrete between facings, they only employed mortar with coarse sand. Yet it sometimes occurred, that it was not possible to set voussoirs, for example, on beds of mortar, when the centering had a very great span, and the arches were very deep; then the joints were run in good plaster. Thus were originally turned the voussoirs of the arches of the western rose window of the cathedral of Paris; and it must be stated that the plaster was excellent, for the plates of the joints were removed as thin slabs 0.04 in. thick without breaking.

It was principally in the interiors that the architects of the middle ages employed plaster, to make deafenings and to cover the floor areas, the panels of half timber work, for partitions, also to form coatings. Most half timber partitions of houses of the 14 th and 15 th centuries are paneled in plaster. We have seen sometimes even windows from one room into another with plaster tracery. In the palace of the archbishop of Narbonne, under the passage from the entrance gate exists a little rose window of the 14 th century in plaster moulded on iron bars, and looking into the adjacent great hall. Also at that epoch were made of moulded and carved plaster the mantles of fireplaces (Art. Cheminee), cornices of apartments, screens,<sup>1</sup> and double openings closed by tapestries. Very early and during the primitive merovingian and Carlovingian epochs, coffins were made of plaster, and in excavations in old cemeteries are found numerous remains. Men also employed sifted plaster to make coatings on stone and even on wood, in order to apply painting to them. The monk Theophilus speaks of numerous works in wood in which plaster plays an important part.





Pure unadulterated plaster acquires great hardness, has a brilliant fracture, is very white and strong. Now the people of the middle ages, artless as all know, had not discovered all the modern procedures by the aid of which one falsifies that excellent material, and their coatings of plaster have a remarkable beauty. However even good plaster does not resist atmospheric agents, and it cannot, and should not be used, except in interiors or in well sheltered places.

Note 1.p.208. The screen was a temporary or permanent partition (clotet) in the great hall. Many great halls of castles thus had screens, that formed as many cabinets to which one could retire. Those screens were only 6.8 ft. high and without ceilings. They were replaced later by folding screens, borrowed from the divisions that the Chinese make at once in their dwellings.

#### PLOMBERIE. Leadwork. Plumbing.

Works in wrought or cast lead, intended for covering edifices, to conduct water, to cover carpentry exposed to the air. leadwork plays an important part in the architecture of the middle ages; it was also an antique tradition, and one cannot excavate a Gallo-Roman edifice without uncovering in the rubbish some remains of lead sheets employed for covering gutters or even roofs. Under the Merovingian kings, entire edifices, churches or palaces, were covered with lead. S. Eloi passes as having caused the covering of the church of S. Paul-des-Champs with sheets of lead artistically wrought. Eginhard<sup>1</sup> writes in one of his letters, that he is occupied in covering the basilica of the martyrs Marullin and Pierre: - "A purchase of lead," says he, "for a sum of 50 livres was agreed on between us." He adds, "that although the works on the edifice are not yet sufficiently advanced for me to occupy myself with the covering, yet the uncertain duration of this life seems to make it a duty, for us to hasten so as to complete, with the aid of God, what we have been able to undertake for utility. Thus I address myself to your good will in the hope that you will be able to give me information concerning that purchase of lead." Frodoard, in his history of the church of Rheims,<sup>2</sup> relates that archbishop Hincmar caused the roof of the church of Notre Dame to be covered with lead. Later at the end of the 12th century the bishop of Paris, Maurice de Sully, left by will





5000 livres to cover with lead the roof of the choir of the existing cathedral. The industry of the worker in lead thus dates in the first centuries of the middle ages, and is continued undiminished until the epoch of the Renaissance. However that industry presents in execution certain serious difficulties, on which we must discourse to our readers, before making known the various means, that have been employed to solve them. As everyone knows, lead is a very heavy metal, very malleable and soft, lending itself perfectly to hammering; but even because it is malleable and heavy, it is always disposed to load and tear the fastenings, that hold it to the shape of the wood that it is intended to cover. The work of the plumber must then tend to maintain the sheets of lead, that he employs, in a sufficiently complete manner to resist the weakening caused by the weight. From this point of view, the old coverings are very judiciously arranged. Further, heat strongly expands this metal, just as the effect of cold contracts it. If it is not left free, if it is attached in a fixed manner, it swells up in the sun and tears the fastenings during great cold. It is then necessary:- 1, because of its weight, it must be strongly supported to not sink; 2, it must be free to expand or to contract, according to changes in temperature. Other difficulties present themselves in the use of lead in coverings. Formerly was employed only lead cast on sand in sheets more or less thick: this procedure had the advantage of leaving to the metal all its purity, and of not concealing defects that appeared, but it had the inconvenience of giving the sheets thicknesses not perfectly uniform, so that expansion acted unequally, or the weight was not the same everywhere. The rolled lead employed very generally today has a uniform thickness, but rolling conceals cracks or defects, that soon appear under the action of the air, and that occasion leaks. Further, rolled lead is subject to pits, which does not happen to cast lead. These pits are made by insects, that perforate the lead in places, and thus form holes about .004 in. diameter, through which the rainwater enters. We have never had to mention this sort of perforations in the old cast lead, while they are very common in rolled lead. We leave to the learned the care of discovering the cause of this singular phenomenon. Another is produced in the use of lead to cover

wood. Formerly the timber and between employed in carpentry and for building is used, and some difficulty is found in getting it to burn. It is now used for fuel and for the manufacture of charcoal. It is a very hard wood and is very difficult to work. It is of pyroligneous acid (particularly the wood of Pinus). which forms with an oxide, white lead, as soon as the metal is in contact with it. The oxidation of the lead is so rapid in this case, that some weeks after the metal has been laid on the wood, it is reduced to the state of white lead, and is soon decayed. We have seen coverings laid under these conditions, and it is very difficult to get them to last. It is with a brief period, until the lead has absorbed all the acid contained in the fibres of the wood. Cases of oxidation of lead in contact with the wood and the metal is not even sufficient to prevent this oxidation, so extensive is the lead for the acid contained in the oak. The consequences of the middle ages did not even have to notice that chemical phenomena, since their wood when used was completely devoid of acid, and their roofing present no trace of white lead when the sheets are raised.

Note 1.p.209. *Edinburgh. As letters to the editor.*

Note 1.p.210. *Formerly all timbers, besides remaining in water, came to the workshop only after having been raised; to today railway transportation brings timbers that have not been in the water at all, and which contain all their sap. Hence they are very serious inconveniences.*

It is with lead roofing as with many other parts of the construction of buildings; we are led a little too soon to believe in the perfection of our modern procedures, and are too little to seek the experience acquired by our ancestors. Lead-work is further so intimately connected with the art of carpentry, that if one desires to cover it with boards, it is first necessary to repare concerning the quality and the source of the wood to be employed. Because of the position in which an architect, man in the middle ages devoted much care to the selection and placing of the wood. Consequently the last and not experience the disadvantages, that we feel today in some kind green timbers, that have never been soaked in tanning water. At least one recognizes that this experience, repeated or not, is good and that it must be taken into account.



wood. Formerly the timber and battens employed in carpentry had long remained in water, and were perfectly purged of sap; today these timbers (of Oak) are often badly purged or not at all,<sup>1</sup> and it results that they contain a considerable quantity of pyroligneous acid (particularly the wood of Burgundy), which forms with lead an oxide, white lead, as soon as the metal is in contact with it. The oxidation of the lead is so rapid in this case, that some weeks after the metal has been laid on the wood, it is reduced to the state of white lead, and is soon pierced. We have seen coverings laid under these conditions, and it has been necessary to replace them several times within a brief period, until the lead has absorbed all the acid contained in the fibres of the wood. Coats of painting or of pitch interposed between the wood and the metal do not even suffice to prevent this oxidation, so attractive is the lead for the acid contained in the oak. The constructors of the middle ages did not even have to notice that chemical phenomenon, since their wood when used was completely deprived of sap, and their roofings present no trace of white lead when the sheets are raised.

Note 1.p.209. Eginhard. 46 letters to the abbot.

Note 1.p.210. Formerly all timbers, besides remaining in water, came to the workyard only after having been rafted; to today railway transportation brings timbers that have not been in the water at all, and which contain all their sap. Hence are very serious inconveniences.

It is with lead roofing as with many other parts of the construction of buildings; we are led a little too much to believe in the perfection of our modern procedures, and care too little to seek the experience acquired by our ancestors. Lead-work is further so intimately connected with the art of carpentry, that if one desires to cover it with boards, it is first necessary to inquire concerning the quality and the source of the wood to be employed. Perhaps because of the traditions from antiquity, men in the middle ages devoted minute care to obtaining and placing wood in the work; consequently they did not experience the disappointments, that we feel today in erecting green timbers, that have never been soaked in running water. At least one recognizes that this experience, reasoned or not, is good and that it must be taken into account.

...and have not the quality given them by that material.

...We have still seen in place in 1935, before the ...  
...of the roof of the cathedral of Chartres, the lead ...  
...perfectly good, was cast in sheets with a thickness of ...

...externally covered in time by a patina, brown and ...  
...and sparkling in the sun. These lead sheets were ...  
...They had a length of about 8.2 ft., nailed at their heads ...  
...on the sheathing with nails of tinued from with very broad ...  
...the lateral edges of each of these sheets were rolled up ...  
...with those of the adjacent sheets, so as to form a ...  
...then 1.6 in. diameter; their lower ends were held by two ...  
...is a sketch of this lead work.

...sheet being pinned perpendicularly to the plate as shown in ...  
...were called together and held very firmly laterally by the ...  
...rounds. These rolls were not so close as to prevent the ex-  
...position of shrinking of each sheet. The lower end of the sh-  
...were held by the bolts, whose heads were nailed on the ...  
...appeared. At each end of the sheet the edge was doubled and ...  
...formed an enlargement I. At C we give at one-fourth size the ...  
...section of a roll. According to this principle the roof of ...  
...the church of Notre Dame of Reims-sur-Worms is covered, and ...  
...in old parts that covering dates from the end of the 15th cen-  
...tury. Here the lead sheets were entered in lines filled with ...  
...one sees some traces of this procedure. ...  
...between the lines some black lines; for it is ...  
...necessary to state that nearly all lead work of the middle ...  
...of a very energetic mordant.

...our external edges are always supported by oak boards, as ...  
...



Leads employed during the middle ages contained quite a notable quantity of silver and of arsenic; ours are perfectly purified, and have not the quality given them by that natural mixture, and perhaps are thus more subject to pits and to oxidation. We have still seen in place in 1835, before the burning of the roofs of the cathedral of Chartres, the lead forming the covering dating from the 13<sup>th</sup> century. This lead was perfectly sound, was cast in sheets with a thickness of about 0.16 in., externally covered in time by a patina, brown and hard, rough and sparkling in the sun. These lead sheets were laid on oak battens, and the sheets were not over 2.0 ft. wide. They had a length of about 8.2 ft., nailed at their heads on the sheathing with nails of tinned iron with very broad heads; the lateral edges of each of these sheets were rolled up with those of the adjacent sheets, so as to form rounds more than 1.6 ins. diameter; their lower ends were held by two iron hooks to prevent the wind from raising them. Here (Fig. 1) is a sketch of this lead work.

Thus the sheets were invariably fixed at the head A; their edges being raised perpendicularly to the place as shown at B, were coiled together and held very firmly laterally by the rounds C. These rolls were not so close as to prevent the expansion or shrinking of each sheet. The lower ends of the sheets were held by the hooks G, whose tails were nailed on the sheathing. At each lap of the sheets the edge was doubled and formed an enlargement I. At D we give at one-fourth size the section of a roll. According to this principle the roof of the church of Notre Dame of Chalons-sur-Marne is covered, and in old parts that covering dates from the end of the 13<sup>th</sup> century. Here the lead sheets were engraved in lines filled with a black material forming drawings and figures of ornaments; one sees some traces of this decoration. Painting and gilding enhance the flat parts between these black lines; for it is necessary to state that nearly all lead work of the middle ages was decorated by paintings applied on the metal by means of a very energetic mordant.

The lead gutters of the middle ages are likewise placed for free extension without soldering and without projections. Their external edges are always supported by oak boards, as practised today, but rest on one horizontal round iron rod suppor-





supported at sufficiently short distances by forged branched angles. Here (fig. 3) at A is the profile of one of those supports, at B being its front seen above the crowning cornice. The angles C are anchored in the cornice slab under the plate S of the roof; the branches are riveted to the rod. The lead sheet of the gutter fixed at a follows the outline a'a" and is rolled up at b, showing externally the angles that support it.

These lead sheets of the gutter are quite thick and with a length exceeding 4.3 ft., being connected by laps as shown in the perspective sketch G. At each lap at the bottom of the gutter is a drop to prevent the water from passing between the joints of the sheets or being stopped by the projections of the laps. Further, the gargoyles for discharge are always very near together; for example, each two or three sheets. The constructors of the middle ages had probably noted that wood externally enclosed between sheets of lead and without a air, soon heated and was reduced to dust. If they made wooden gutters on houses, they left visible the outer face of the gutter, only covering it with strong relief, as indicated in fig. 3, to preserve it from the direct action of the wind. The fronts of wooden gutters were generally moulded, sometimes even carved and covered by painting.<sup>1</sup>

Note 1.p.213. We have seen remains of gutters of this kind on houses of Rouen, Orleans and of Bourges.

If the plumbers of the middle ages devoted scrupulous attention to the shape of the coverings, they excelled in covering woodwork with lead, in repousse work with the mallet in lead, and they made this industry one of the principal crowning decorations of edifices. Articles Epi and Crete give some examples of these works in hammered lead, that recall the best models of jewelry of the epoch. It is easy to see, even by the irregularities of this sort of works, that they were executed without models; they were composed by cutting out ornaments from sheets of lead of good thickness, and giving relief to these flat surfaces by means of small wooden mallets of different forms. Old ornaments, that we have examined with the greatest care, have shown us the traces of that very simple manufacture, but which requires the taste of an artist and of a knowledge of the development of surfaces.

... of the cross-flower or terminal, such as that shown in  
... of these surfaces on a plane, tracing their outlines on a  
... of the leaf, which was the same as that of the leaf  
... giving the proper relief to that flat surface and one. These  
... of the leaf, which was the same as that of the leaf  
... one stem (leaf) slip over the double one 3 soldered to  
... the stem and placed at 1. Round iron rods are soldered on  
... side in the grooves formed in the relief of the leaves, and  
... give the surface, which is flat, the relief of the leaves  
... then were presents a triangular section, the development of a  
... side of the three leaves remaining within the angle 8 3 4. In  
... therefore the three leaves being clamped and soldered together  
... or from 2 to 4 at the base of their stems, the leaves 4 are  
... bent so that they touch at their ends, and they are joined by  
... a group of solder, which gives stability and stiffness to the  
... three leaves, which are the same as that of the leaf  
... by modeling a flat surface, in order to cut out the leaves  
... the surface and without soldering the leaves, the surface  
... the middle axis. These works that appear so difficult to do,  
... not having acquired in any school the use of these effects,  
... have an attractive force for them, for they certainly would  
... few difficulties to conquer.<sup>1</sup> Concerning soldering in this  
... of the leaf, they are the same as that of the leaf  
... case, as the leaf is the same, and that is to be the same  
... of the leaf, which is the same as that of the leaf  
... as a curved wood. For example, if they had to make a one-  
... leaf, they formed the ball A (fig. 2), then covered it with  
... leaves, which were soldered together, and then the leaves  
... to the principal body as seen in the section 3. But all 3  
... that was light, soiled and detached, as suited to metal. In  
... the ball was reduced at its middle, and presented a diameter  
... is a ball of the same size, but the leaves were of a  
... leaves were soldered together, and then the leaves  
... were soldered together, and then the leaves were soldered together.



For example, desiring to execute in lead in relief an ornament of the cross-flower or terminal, such as that shown finished at A in Fig. 4, account must be taken of the development of those surfaces on a plane, tracing their outlines on a sheet of lead, cutting them out as shown by Fig. 4 bis, gradually giving the proper relief to that flat surface cut out. These sheets (Fig. 4) are clamped and soldered on a lead stem, indicated in section B made on a b. Bands of lead soldered inside the stem (detail C) slip over the double pins D soldered to the stem and placed at d. Round iron rods e are soldered outside in the grooves formed in the relief of the leaves, and give them stiffness, ending in lead flowers as seen at E. The stem here presents a triangular section, the development of e each of the three leaves remaining within the angle B G H. Therefore the three leaves being clamped and soldered together from g to h at the base of their stems, the leaves k are bent so that they touch at their ends, and they are joined by a drop of solder, which gives stability and stiffness to the upper part. A great acquaintance with the developments of surfaces was required, and of the effects that could be obtained by modeling a flat surface, in order to cut out the leaves w with certainty and without spoiling the lead. But the building artisans never handled developments better than those of the middle ages. Those works that appear so difficult to us, not having acquired in any school the use of these effects, were an attractive sport for them, for they certainly sought new difficulties to conquer.<sup>1</sup> Economizing solderings in this sort of works, they modeled the sheet of metal with charming taste, as one would model clay, and they left to it the appearance suited to that material, without pretending to imitate stone or carved wood. For example, if they had to make a capital, they formed the bell A (Fig. 5), then covered it with crockets, with leaves modeled separately, soldered and clamped to the principal body as seen in the section B. But all that was light, spirited and detached, as suited to metal. The bell was reduced at its middle, and presented a diameter less than that of the column, so that the applied stems by their thickness should not exceed the diameter of the shaft. These ornaments were often merely clamped, which avoided all breaks and facilitated repairs. Small iron rods soldered ins-

...the ... of ...  
... from ...  
Note 1.9.218. Without too much ... we can state that ...  
... of the ... from 1847, to attempt to ... that ...  
... entirely abandoned since the 18th century, for the  
... of ... are ... for example. We have seen  
... an intelligent man, and a very rare thing, one ...  
... to leave ... in ... since deceased,  
...  
...  
... is ... to ...  
... to ...  
... to ...  
... of the ... of ... who sometimes are intent to  
... the ... of ...  
... all their ... as so ... that one could remove it  
... of ... it is ...  
... of a ... roof, without ... in ...  
... If the ... covers ... like  
... the ... the ...  
... a ... will be covered as indicated at A, fig. 6.  
... will be covered as seen at B, C. The lead follows  
the contours and will be stiffened by these frequent bands;  
it will be ... of ...  
... with ... and covering in the same manner the  
... must be fitted to these ...  
... will be attached on the sheet as seen at D, E, F.  
... of the ... and the ... of ...  
... of ... in order that their  
... may not ... from ...  
... of ...  
... of the ... and prevent it from  
... are taken to ...  
and prevent the ... Great decorated ...  
are composed of a series of cylinders or ... that cover ...  
... These ... can be ...



inside the leaves or crockets gave them stiffness and prevented them from bending.

Note 1.p.215. Without too much vanity, we can state that we were one of the first from 1847, to attempt to revive that industry, entirely abandoned since the 18 th century, for the lead works at Versailles are cast, for example. We have been seconded by an intelligent man, and a very rare thing, one disposed to leave routine aside, M. Duprand, since deceased, after having restored to that beautiful industry a part of its splendor.

In all leadwork, it is necessary to foresee the case of repairs, and to arrange the fastenings, clamps, and laps so that it may always be possible to remove easily an injured part and to replace it. The expansion of lead, a defect in a sheet, the blows of the beaks of rooks, who sometimes are intent to pierce a sheet, may require the replacing of a piece of lead. The plumbers of the middle ages foresaw these accidents, for all their lead work is so arranged, that one could remove it in sheets or fragments, just as one removes tiles, crestings or hips of a terracotta roof, without touching parts in good condition. If the lead directly covers shaped woodwork, like that of a dormer or spire, the sheets are never joined by soldering, but by skilfully placed locks, laps and clamps. For example, a column will be covered as indicated at A, Fig. 6; mouldings will be covered as seen at B, B'. The lead follows the contours and will be stiffened by these frequent bends; it will be fastened at the top alone at b, being covered by upper sheets with clamps, and covering in the same manner the lower sheets. If the ornaments must be fitted to these mouldings, they will be attached on the sheet as seen at B', i.e., by the clamps and the drops of solder d.

If necessary to place sheets on vertical planes, like the sides of dormers, bases of spires, etc., in order that their weight may not tear out the head nails, these sheets are clamped diagonally on each other as seen at D. Hooks of iron or copper hold the lower edge of the sheet and prevent it from rising. lead clamps are nailed on the wood, are taken to lap and prevent the sheets from waving. Great decorated terminals are composed of a series of cylinders or prisms that cover each other without soldering. Thus these kingposts can be re-





removed and replaced without difficulty. A forked iron bar fixed on the kingpost of the carpentry will support vertically the different members. In relief lead work forming the ornamentation, soldering is employed only to connect ornaments formed of two parts, like rings, flowers in full relief, or to attach leaves, stems and flowers.

About the end of the 15 th century, hammered lead ornaments were sometimes replaced by lead ornaments cast in moulds of stone or plaster.<sup>1</sup> But those cast ornaments are at a very small scale, and are far from having the decorative appearance of hammered lead. The lead workers made statues of all dimensions, and these are still seen on the roofs of the cathedrals of Amiens and of Rouen, that date from the beginning of the 16 th century. Those figures were nearly always hammered on a model of wood or iron in parts, then soldered together. Then care was taken to make the model very lean and dry, so that the thickness of the lead sheet should restore it to <sup>the</sup> plumpness lacking to it.

Note 1.p.218. There still exist several of those models; some are seen in the hospital of Beaune, that served for casting the ornaments of the terminals of the roofs.

What gives the lead work of the middle ages a special charm is, that the means of fabrication employed and the forms adopted are exactly suited to the material. Like carpentry and like joinery, lead work is a separate art, that borrows neither from stone nor wood the appearance that clothes it. The lead work of the middle ages is treated like colossal goldsmith's work, and we have found striking relations between these two arts, if not in means of attachment, at least in the forms adopted. Gold and applied colors replace enamels. Beautiful lead work was also made during the 16 th century, although the means of attachment and of covering were then less studied and careful than during the preceding centuries. The spire of the cathedral of Amiens, partly recovered with lead at the beginning of the 16 th century, partly repaired in the 17 th, allows one to appreciate the decadence of that art during the space of a century.

The lead work of the chateau of Versailles and of the dome of the Invalides are recommended rather by the weight, than by the care taken in the execution; while the unfortunately





rare woodwork remaining to us from the 13 th, 14 th and 15 th centuries, is remarkable by its relative lightness and by a very careful execution. To be convinced, it suffices to see the old lead work of the church Notre Dame of Chalons-sur-Marne, and of the cathedral of Rheims, of that of Amiens, of the mansion of Jacques Coeur, of the hospital of Beaune, of the cathedral of Rouen and that of Evreux,<sup>1</sup> of numerous fragments scattered on several monuments or mansions. There still existed before the end of the last (18 th) century many edifices of the middle ages, that had retained their lead roofing. This lead work has been generally removed. It is then not surprising to find today only a small number of examples. However it is due to studies, so frequently attacked, that we have been able to revive one of the most beautiful of the building industries.

Note 1.p.220. The lead work of the spire of the cathedral of Evreux has been very unskillfully restored at different epochs; one finds in the midst of these repairs only fragments, but executed with refinement.

#### POINCON. Kingpost.

A vertical part in carpentry that receives the upper ends of the principals of a truss, on the hips of a hip roof or spire.

#### POITRAIL. Sill.

A very large timber placed horizontally on piers or posts and supporting the facade of a house. (Arts. Maison, Boutique, Pan-de-Bois).

#### PONT. Bridge.

We shall divide this Article into several parts; these are bridges of stone or permanent ones of wood; movable bridges, drawbridges, and bridges of boats, floating, and those on wheels (pontoons).

The Romans were great builders of bridges, either of stone or of carpentry, and in Gaul were long used the bridges, that they had built over rivers.

Gregory of Tours relates that king Clovis sent an embassy to his nephew Childbert, to ask for peace from him, and to





pray him to come to see him. Childebert came to meet him with his great men, and both meeting near the bridge called the stone bridge, saluted and embraced." <sup>1</sup> This bridge was one built by the Romans. Yet they, by reason of the abundance of timber in Gaul, must build a great number of bridges of carpentry, that still remained during the first centuries of the middle ages, for stone bridges built by the Romans are still to be seen though rare; had they been numerous, traces of them would be found on our rivers.

Note 1.p.221. Book X. Chap. 17. Pont-Pierre, now pompienne is a village on the Mouzon near the Meuse.

The Romans almost always established arches or monumental gates, either at the ends of bridges or at the middle of their length. These arches became during the centuries of peace, that followed the definite conquest of the soil of Gaul, rather motives of decoration than of defense, but from the first invasions these gates were furnished with battlements, and they can be regarded as starting points of those little castles or forts, that always were attached to the bridges of the middle ages, whether of stone or wood.

There remain to us no stone bridges of the middle ages preceding the 12 th century; <sup>2</sup> but in that epoch were constructed a very great number and in extremely difficult conditions. One of the most beautiful and most considerable is the bridge St. Benezet at Avignon. The legend claims that a young shepherd, named Petit Benoit, born in 1165 in Viverais, was inspired from high, came to Avignon in 1178, and was the promoter and architect of the bridge across the Rhone at the location of the rock of the Doms. Of this bridge still remain four arches and some piers of very remarkable construction. Begun in 1178, it was completed in 1183; its length is 2953 ft.(0.56 mile), and the width of its floor is 16.0 ft. including the balustrades. To resist the current of the Rhone and masses of ice, the piers are 98.4 ft. from one edge to the other, ending upstream in a very acute edge. It is necessary to state that there the Rhone is very rapid and divides in two branches; one being much wider than the other; the narrower flows beside the rock of Doms, and is of great depth. The difficulties in establishing this bridge were then considerable, the more that at least once a year the floods of the Rhone reached a height a





averaging 16.4 ft. above low water. Without discussing the more or less truth in the legend relating to the shepherd Petit Bernoit, it seems certain that this person was the chief of the confraternity of the "Hospitalieres pontifices" (Hospital bridge-builders), that undertook the construction of the bridge of Avignon. That confraternity was established in the 14 th century to build bridges, establish ferries, and to give assistance to travelers on the banks of rivers.<sup>1</sup> However that may be, the bridge of S. Benezet was wisely constructed and would still exist, were it not for the wars and the negligence of the people of Avignon.

Note 2.p.221. In his work on *Proits et Usages*, M. A Champollion-Figeac cites a gothic bridge of the 11 th century dependent on the castle of the counts of Champagne at Troyes; but that bridge as well as the castle on which it depended were demolished many years since, and the reproduction given in the *Voyage archaéologique* of M. Arnaud is due to the imagination of that author.

Note 1.p.222. The religious confraternity of Brothers of Hospital Bridge-builders originated and was established at M. Moupas in the diocese of Lavaillon after the year 1164, according to the *Recherches historiques* of Abbe Gregoire. Petit Bernoit or S. Benezet was the chief of that institution, and commenced his labors at Moupas; it would be after this first work that he undertook the construction of the bridge at Avignon.

Clement VI caused four arches of it to be rebuilt. The Catalans and the Aragonese cut it in 1395, during the siege of the palace of the Popes. In 1418 the people of Avignon caused the cut arch to be rebuilt; but either the work was badly done, or other parts of the bridge had not been maintained, an arch fell and brought the fall of the others in 1602. In 1633 two others fell, and during the winter of 1670 it is stated that over the main branch two arches fell.<sup>2</sup> These arches were replaced by carpentry, good or bad, but after more than a century this fine monument was reduced to four arches that belonged to the little castle on the city side. This bridge was the sole permanent communication existing between the papal territory of Avignon and the French territory of Languedoc. In the early time the city had extended its jurisdiction into the islands of the Rhone and opposite its territory along the





the entire right bank of the river. Its justiciaries had caused the erection of their gibbets, some before the fountain of Montaud, and others on the rock North of the place of the Angles, that is still called the Justice. While the kings of France possessed the city of Avignon jointly with the counts of Provence, they placed no obstacle to this extension of the jurisdiction of the city, but when in the month of September, 1290, Philip the Fair by reason of the marriage of his cousin Charles to Marguerite, daughter of the king of Sicily, count of Provence, he claimed to make respected in future his territorial limits; in consequence his officers in 1307 laid the foundations of the tower of Villeneuve, that closed the bridge at the right bank of the river. Charles II, king of Sicily, complained of this act, that he regarded as an infringement of his rights, consecrated by custom, alleging that the territory of Avignon extended to the shore of the right bank of the Rhone. The king of France directed his seneschal of Beaucaire to make an investigation in the matter of that demand; he traveled to the place and arranged to hear witnesses, when the magistrates of Avignon intervened, saying that the seneschal could not act in the name of the king of France in the place that was of the domain of the jurisdiction of the king of Sicily, count of Provence. Rodolphe of Meruel, architect of the tower of Villeneuve, only pushed with greater energy the construction of that defense, and it did not seem that the king of France, once well placed at that point, would tolerate on the right bank of the river the exercise of the jurisdiction of Avignon. Yet that jurisdiction was exercised for some time in the islands; but after having so well established what they regarded as a right, the officers of the king of France took care not to stop in such a good cause, and they opposed every act of the jurisdiction in the islands.<sup>1</sup> If we have related at some length this history of the bridge of Avignon and of the structures that closed it on the side of France, this is to make known that the difficulties presented by nature were not the only ones, that were to be surmounted in feudal times, when it concerned the building of the bridge. Indeed rivers and often small streams formed a boundary between territories belonging to different lords, and the establishment of a bridge destroyed that limit, each one then sought





to close this communication from one territory to another by a little castle, or simply opposed its erection. The feudal divisions, and yet more the weakness of the builders, became an obstacle to the establishment of bridges.

Note 2.p.222. In the collection of *Plans et profils des principales villes et lieux considerables de France*, by Lord Tassin in 1692, there is given a view of Avignon with the bridge of S. Benezet. Two arches are wanting on the island and three over the main branch.

Note 1.p.223. Archives municipales d'Avignon; proces du Rhone. Vol. I. p. 65. We owe this date to the learned archivist of the prefecture of Vaucluse, M. Achard, who possesses on t Avignon and the county of Venaissin precious notes, the use of which he has courteously allowed us.

Fortresses on bridges could only be established by authorization of the founders; but it is necessary to believe that necessity often caused this condition to be infringed, for we know no important bridge in the middle ages not so defended. No more could tolls be established without the consent of the founders.<sup>2</sup> William the Great, duke of Aquitaine, by a charter of 998 forbids forever the collection of tolls for the passage of the royal bridge. "Eudes, count of chartres, Tours and Blois, made a similar prohibition in 1036. He declared that having caused the building of a bridge at Tours with the sole purpose of performing a meritorious action for the good of his soul, he desired that no tolls of any kind should be levied."<sup>3</sup> It probably did not enter the minds of the founders of the bridge of Avignon to establish defenses there, at least on t the right bank, and yet we see that a century after its construction, the king of France planted on the bank a fortress, that forbade entrance or exit, and that the Popes fifty years later built a little castle on the left bank. Thus this bridge for public use saw both its ends closed by the two lords, each occupying a bank.

Note 2.p.223. M. A. Champollion-Figeac, in his collection entitled *Droits et usages* (Paris. 1860), says that "a charter of the emperor Frederic, of the year 1158, and an act relating to the abbey of S. Florent (Coll. de Comps), of the year 1162, for a bridge built over the Loire, again states these two facts" (forbidding the erection of fortresses on bridges or lev-





levying any tolls whatever without the authorization of the founders.

Note 3.p.223. The same, p. 125.

Tolls levied on bridges were ordinarily applied to their maintenance; but one understands that these resources were frequently diverted from this use; thus most of these bridges were badly maintained. Most of those remaining to us exhibit great deteriorations, that run for several centuries. "In time of war the lord of the sword in many provinces of France had the right to demolish the bridges, even those to the construction of which he had not contributed; but it was necessary to be a case of the common safety. Still it was necessary to obtain special permission from the lord of the sword to be able to rebuild this demolished bridge for the purpose of temporary safety."<sup>1</sup> Thus many bridges of the middle ages were cut, and were only repaired temporarily, which also contributed to their ruin. The bridge of S. Benezet found itself precisely in that case. What remains of it allows us to study it and describe its construction. The arches had spans of 65.6 to 82.0 ft. and were 18 in number. On the island separating the two branches of the Rhone the causeway was arched, as well as over the two streams. Over the great branch the bridge at the side next Villeneuve formed an obtuse angle, as if to better resist the force of the current. But we shall soon return to that general arrangement. Here (Fig. 1) at A is the elevation of an arch with two piers. It is to be noted, that of the four piers that still exist entire, two are built according to the sketch B and two like C. On one of those like C and nearest the city is built a little chapel dedicated to S. Nicolas, in which were deposited the relics of S. Benezet. The floor of that chapel is placed 14.8 ft. below the floor of the bridge, and one descends there by corbelled stones, partly at the expense of the thickness of the bridge as shown by the plan D.<sup>2</sup> To pass before the chapel there was left to the floor at D a width of 6.6 ft., including the thickness of the balustrade. Through an arch one could see from this pavement the interior of the chapel, and an arch that opened upstream on the pier. The other pier was constructed the same with trumpets, and does not seem to have been intended to receive another little structure;<sup>3</sup> perhaps it only formed a platform very necessary

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 immediately adjacent area were the only ones that were  
 the only ones in the area. The water was not frozen  
 and to a certain extent was not frozen. The water was not  
 and adjacent to areas of water. This was a point of  
 which was adjacent to the bridge of the river, and for  
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 the investigation of the river was the purpose of the  
 of a single one of the points of the river, and the  
 and the central area in the river. The investigation was very  
 adjacent to the river. The river was the river, for  
 the water sometimes rose to the level of the river.

Note 1.0.221. Points of water, M. A. Rhodoffon-1920.

1.0.221.

Note 2.0.221. This plan is made both for the bridge floor

and for the chapel below.

Note 3.0.221. There is no mention of any canal on the  
 bridge of Avignon in old documents, that we have been able to

investigate.

Note 4.0.221. Notably in 1889.

It is not known how the water of the river was  
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 four rows of water, 2.5 ft. deep, placed and covered. They  
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for a place so narrow and so long. These piers with trumpets probably alternated with those not possessing them, and which are conformed to the shape B. The arches are not traced according to a circular arc but form an oval, as shown in the Fig. and obtained by means of three centres. This was a means of giving more strength to the branches of the arches, and for permitting the establishment of trumpets with stairs. The piers possessing trumpets were pierced by three arches instead of a single one above the projecting ends, the chapel obstructing the central arch in the pier C. That precaution was very necessary to give a passage from the floods of the river, for the water sometimes rose to the level G.<sup>1</sup>

Note 1.p.224. Droits et usages, M. A. Shampollion-Figeac. p. 131.

Note 2.p.224. This plan is made both for the bridge floor and for the chapel below.

Note 3.p.224. There is only mention of one chapel on the bridge of Avignon in all documents, that we have been able to consult.

Note 1.p.226. Notably in 1856.

At H we give the section of an arch with the transverse profile of the pier B. These arches are constructed by means of four rows of voussoirs 2.3 ft. deep, placed end to end. They are actual transverse arches perfectly jointed, whose beds continue, but are not bonded together. They are made solid only by the mass of masonry surmounting and loading them. It is to be believed that the master bridgebuilder desired in this to copy a Roman bridge quite near, the aqueduct of the Gard, whose main arches are constructed on this system. At K we present a perspective sketch of the trumpets placed at a on two of the four existing piers, with the arrangement of the corbelled stairs, that permits descent to the chapel.

We do not know today how the bridge of Avignon terminated at the city side, when it was built at the end of the 12<sup>th</sup> century. Very high above the level of the streets, it probably ended already at a defense, from which one descended into the city. In the 14<sup>th</sup> century the Popes terminated it by a new and very strong little castle, that defended the entrance to the city; but if one did not wish to enter the city, or if the gates of the little castle were found closed, one could





descend from the pavement of the bridge to the quay, that extended along the rampart, by a broad flight of steps placed upstream.

On the Languedoc bank, in crossing the bridge, one came against the formidable tower of Villeneuve and its accessory defenses, he entered the enclosure of the fortress, or indeed by turning to the right and passing through a gate, he entered the outer enclosure of Villeneuve. Fig. 2. presents the general appearance of the bridge of Avignon with the bend formed at the middle of the long arm. At the bottom of the Fig. is the existing little castle built by the Popes. At A is the island crossed by the bridge and frequently inundated; at the upper end is the tower of Villeneuve. The entire construction of the bridge except the facings of the piers and the arches is made of very small stones very like those facing the tympanums of the upper story of the aqueduct of Gard. The masses are entirely solid and laid with care in excellent mortar. The stone came from the quarries of Villeneuve and is not of very good quality. It is to be believed, that if this bridge had been maintained like the bridge S. Esprit built soon afterwards, that it would have been preserved till our days, for it was established in excellent conditions, and nearly all its piers rest on the solid rock; but as seen above, men contributed as much as the terrible waters of the Rhone to destroy it. From the epoch when men must renounce this means of crossing the river, there was established downstream a wooden bridge frequently injured by the floods of the Rhone, and over the small branch for thirty years has been a suspension bridge of very doubtful durability. By glancing at our Fig. 2, one notes that the bridge of Avignon much resembles a foot bridge of planks laid on boats. The bridge-building brothers, to resist the powerful action of the Rhone at that point, especially during floods, imagined nothing better than to establish in stone and permanently what common sense indicates is to be done, when a bridge of boats is built, and this was not too badly conceived.

In the country of S. Saviourin-du-Port on the Rhone and belonging to the abbey of Cluny, an abbot of that order, Jean of Tensonges, caused to be commenced in 1265 the bridge of S. Esprit, over which one still passes today. Thirty years were





employed in its construction. The width of its pavement is 16.4 ft. and its length is about 3281 ft. (0.825 mile), the number of its arches being 22. These are round and do not present the peculiarity in drawing observed at the bridge of S. Benezet. Yet they are constructed by means of rows of voussoirs set end to end. In the haunches the arches allow the floods of the river to find a passage. The bridge S. Esprit was the last work of the bridge-building brothers. Then the relaxation of that order contributed to its complete decadence. It must be stated that after the 13 th century in civil and religious structures, the schools of the lay masters of works had everywhere replaced the religious corporations, the cities like the lords no longer needing to resort to the bridge-building brothers and others. The bridge S. Esprit forms a bend opposing the current in the great branch of the Rhone, as at the bridge of Avignon. It was also closed at both ends by gates in the 17 th century, and ended at the city side in a quite important defense of the 14 th century, that later formed a part of the citadel, and corresponded to the course of the river downstream. One can obtain an idea of these defenses by glancing at the engraving given in the *Topographie de la Gaule*.<sup>1</sup>

Note 1.p.228. Edition of Frankfurt, engravings by Herten. -- Two arches of the bridge S. Esprit were recently destroyed to be replaced by an arch of cast iron to facilitate the passage of boats. It was necessary to remove with great difficulty the suppressed pier, whose masonry was excellent.

Among the bridges of the 12 th century that we still possess in France, must be cited the old bridge of Carcassonne, built by the care of the city in 1184. The tolls of this bridge were destined to maintain it. Its arches are round, built with bonded voussoirs, that set separate like those of the bridge of Avignon. Its piers are sharp at both ends and rise to the floor, forming very useful platforms, the pavement having a width not over 16.4 ft. It was formerly defended at the end opposite the city (left bank) by a formidable bridgehead, that enclosed nearly all the present suburb. A chapel of the 15 th century is attached to its first abutment at the downstream side. On the city bank it relied on the defenses of that fortress by a line of flanked curtains. This bridge still serves today, though it has been very badly maintained for a long time.





The old bridge of Beziers dates from nearly the same epoch. The arches are round, that at the middle being higher than the others, so that the pavement forms two straight slopes. The haunches of this bridge are opened by arches in foresight of the floods of the Herault, and its piers are flat downstream and sharp at the upstream side. We give (Fig. 3) the central arch of this bridge, with its plan at A and a detail B, indicating the construction of the projections of arches at the upstream sides. Its pavement is 18.4 ft. wide. The pavements of the bridges of Avignon and of S. Esprit are level, which explains the enormous length of those bridges; but the bridges of the middle ages of ordinary length usually present two slopes, the central arch being higher and wider than the side arches, to facilitate navigation and to leave at the middle of rivers a wider and higher passage for floods. Yet it is clear that the architects sought as much as possible to avoid those slopes, and many of their pavements are nearly level from the time that their location permitted the establishment of quays and elevated abutments. Yet when they were forced to open the haunches in the foresight of strong floods, they utilized the spaces in the piers to form relieving platforms, and this motive has supplied us with good architectural motives. The exedras of the Pont Neuf at Paris are an tradition of that arrangement, that further dates from antiquity.

"It was provided for the maintenance of bridges," says Baron de Giraudot,<sup>1</sup> "by means of tolls called 'pantage' and finally 'billette', because of the trunk or branch of a tree to which was attached the tariff stating the tolls to be paid. The toll was required for passage over or for passage beneath. A toll on salt transported by boats supplied the costly maintenance of bridge S. Esprit and of the stone continually renewed, that protected the piers from the undermining to be feared because of the rapid flow of the river. The tolls on the very old bridge had been established by authority of the lords, but when the royal power had advanced its work of centralization, the king alone could establish them for his benefit, or that of the tenants of the domain, either in feu or by dues. The lord high justiciars were not maintained in their rights in that respect, except by proving very ancient possession."

Note 1. p. 229. See the important Article on bridges, publish-





published by that learned archaeologist in *Annales archæologiques*. Vol. VIII. p. 17 et seq.

The lord was held for the tolls to maintain the bridges; but often the bridge was destroyed, and he continued to collect the tolls, if not on the bridge at least for navigation; so that bridges in ruin, that already became an obstacle for boating, were still for them an occasion for paying for the right of passage. "At the origin," says Baron de Girardot, "the right of tolls carried the obligation to ensure to travelers the safety of their persons and property; in case of theft or murder, the lord was held to indemnify the victim or the party entitled. There are cited decrees rendered in this sense against the lord of Crevecœur in 1254, the lord of Vichon in 1269, and others of the same epoch, some being even against the king for thefts committed within his justice (1295). Yet this responsibility occurred only in the day and not in the night." This explains why the bridges of the middle ages are furnished with guards, that collected the tolls, and then maintained the police over their vicinity and in the suburbs. Many of those towers are little castles, that secure the exits from bridges and sometimes their middle, are then actual guard-houses and toll offices. Still most frequently it is necessary to see in those buildings actual defenses, for example, if the bridges give access to market towns or defended cities. Thus the old bridge of Saintes, now demolished, but which we saw entire 25 years since, formed on the Charente a formidable obstacle, both against the boats coming with hostile intentions, and against parties appearing on the right bank. This bridge was built on the Roman piers, and even presented on one of those near the right bank an antique gate, forming a triumphal arch with two openings.<sup>1</sup> The view (Fig. 4) gives an idea of the general arrangement of this bridge defended by a series of important works. At first at the side of the suburb of Dames, located on the right bank of the Charente, appeared the first gate, then came the Roman arch crenelated on its upper part during the middle ages; then at the city side was a tower of oval plan through which it was necessary to pass;<sup>2</sup> then finally the gate of the city flanked by turrets. From the gate at the suburb of the Dames to the ancient arch the bridge was built of wood, as well as the great tower at the city gate, so





that the floor of those parts of the bridge could easily be removed, all communication being interrupted between the city and the suburb, or between the city and the great tower. The arches of the bridge rebuilt in the middle ages on the Roman piers were pointed, and the floor was slightly raised at the centre. The great tower not only defended the bridge, but commanded the gate of the city in case it had fallen into the power of an enemy landing on the left bank, and dominated the course of the river. The parapet of the bridge was formerly crenelated in order to permit the garrison of the tower to absolutely stop navigation. These defenses did not date before the 14th century. As for the bridge itself, it dated from several epochs, as far as the successive repairs made to the arches permitted to be recognized.<sup>3</sup> The bridge of Saintes, although deprived of its great tower and its defence next the city, did not fail to present a real interest 20 years ago, it was demolished without serious reason and replaced by a suspension bridge, that it is understood must soon be rebuilt, the duration of that sort of bridge scarcely exceeding a half century.

Note 1.p.231. This arch of triumph was taken down piece by piece, when the demolition of the bridge was definitely decided, and it was rebuilt on the bank of the same river by the care of the commission of historical monuments, under the direction of M. Clerget, Architect.

Note 2.p.231. That tower served as the municipal prison at the end of the 16th century.

Note 3.p.231. The great towers of the gate of the city were demolished after the religious wars, but one perfectly indicated in the cavalier view in the collection of 1544; *Civitates orbis terrae*. (cities of the earth).

Our old French cities, that mostly presented a short time a particular character, and that one loved to visit when still retaining their monuments, under the influence of a temporary infatuation, permitted the destruction of many precious remains. let us hope that their municipal councils are better instructed in their true interests, and will religiously preserve the remains of their ancient splendor, respected by time, when those remains further can nowise hamper the developments of modern activity, and are an attraction to travelers. The





Roman arch of Saintes, so precious on the bridge, today makes the strangest appearance on the bank, and seems to be an edifice stranded there by chance.

Happily the city of Cahors has not yet destroyed its marvelous bridge of the Calendre, one of the most beautiful and most complete left to us by the 13<sup>th</sup> century. The construction of the bridge of the Calendre dates back to the year 1251, and merits a special study. This bridge was connected with the walls of the city, commanded the course of the Lot, and reached the low hills on the opposite bank. The city of Cahors possessed three bridges built on nearly the same model; the bridge of Calendre is that of the three best preserved. It consists of 6 principal pointed arches very high above low water. On the central and the two end piers (Fig. 5) rise three towers, that of the centre being square, and the two end ones are rectangular. From the floor of the bridge crenelated stairs permitted ascent to the second stories of those towers. The city is located at A. On the opposite bank at B rise abruptly quite high hills of limestone. One reaches the bridge laterally by following the course of the Lot, either up or down the stream, as we see at C. It is necessary to pass the gate defended by a little castle D, that commands the road and the lower slopes of the hill B. This double gate gives admission at a right angle to the pavement of the bridge before the first tower E. The parapets of this first bay were crenelated, and communicated at one side by a stairs F also crenelated, with the upper defenses of the little castle. It was then necessary to pass the tower E, well defended in its upper part by machicolations, and by a gate with internal machicolations. The gate E being passed, one entered the first half of the bridge commanded by the central tower G, to which one ascended by a stairs constructed within a work built on one of the projections. That central tower was likewise closed by a gate. That being passed, one entered the second half of the pavement, commanded by the third tower H, equipped with machicolations at its top. At the city side the last gate I defended the approaches to that third tower, to which one ascended by a crenelated stairs placed on a flying buttress. The projections of the piers served as relieving platforms and were crenelated so as to flank the bridge and to strike the river.





All these works except the little castle D<sup>1</sup> and the crenelated crests of the parapets of the ends of the piers are still intact, as one sees, and present a very beautiful entirety. The construction is done with good materials; the voussoirs of the arches have cut extradoses, which is one condition of solidity and elasticity. In this respect, we observe that Roman bridges as well as those of the middle ages always have arches with cut extradoses, and not without reason. Indeed, when heavy loads pass over the arches, if they have a sufficiently great span, there is produced in the haunches a sensible movement of vibration; if the voussoirs are independent of the construction of the haunches, they retain their elasticity and cannot transfer the vibration to a distance; but on the contrary if the voussoirs are unequal or have horizontal parts, i.e., if they are deeper at the haunches than at the keystone, the oscillatory movement is produced in the entire length of the bridge, and it strongly weakens the piers. One can observe this fact on the bridge Louis XV at Paris, built by the celebrated engineer Perronet. When a heavily loaded wagon passes over the middle arch, one notes a sensible vibration on the entire length of the bridge. To obviate danger from this vibration, the engineer Perronet was accustomed to insert iron cramps in the tails of the voussoirs; but if he thus ensured the stability of all parts of the bridge, he placed a very active destructive agent in the masonry, one that sooner or later will cause notable disturbances. Arches with cut extradoses according to the Roman and mediaeval methods, on the contrary have the advantage of making each independent, and of forming an elastic ring, that can move and vibrate between two piers without transferring that oscillation farther. Our modern engineers are better advised and have returned to that method; but that proves that the constructors of the middle ages had acquired experience in that sort of structures. One can reproach them with having multiplied piers, thereby obstructing the routes of navigation; but it is necessary to consider that the bridges of the middle ages were built to establish communications from one bank of the river to the other. They were also means of defense, both on the land route and on the river route, and the multiplicity of the piers strongly facilitated that defense. Besides those bridges were

not reported in the same way as the other two. The  
quantity of resin was caused to be about 10 and 20  
times more; therefore it was necessary that the  
oil should not overheat and should not be too  
much as relatively small and sufficient heat  
was the result. The necessity for oiling the  
oil was the result of the oiling and the  
amount less than the other two.

Note 1.9.288. There remain only the lower parts of this list.  
the coast.

The relief platform at each side of the floor. Again a reason of defense was the motive of that arrangement, for everywhere that the bridges do not have that protection from the military point of view, it will show protection against the enemy are first destroyed, as they would be the center of the bridge at Leningrad, described by M. Felix de Vertessin in his book "The Artillery". That learned archaeologist, so much as one such opinion looks on the French monuments of the middle ages, has also observed that on several of these bridges of Leningrad, those piers are often composed of only a facing of granite, in the midst of which is ranged a mass of earth. That was an economical method, whose use we have seen able to prove, and that we think dates from a very high antiquity, for the remains of Roman camps presented the same peculiarity. The projecting ends of several bridges of Leningrad give in horizontal section, neither an acute nor a right angle, but a pointed curve, which has the advantage of allowing the sliding of ice running water, and of giving greater strength to these spans; for it is clear (Fig. 6) that the section

FIG. 6.

(7), that the external stairs leading to the towers are open on the side toward the city along the parapet, so that if the little castle were taken, by closing the gate of the cover, the defenders could overthrow the assailants and receive reinforcements from the city. The walls of the central tower



not erected in the space of two or three years, like ours. Penury of resources caused 10 and 20 years to be spent in building them; therefore it was necessary that the closing of an arch could not overthrow the adjacent piers, and that these should be relatively strong and sufficiently near together to resist the thrusts. The necessity for building these bridges in parts caused the adoption of the pointed arch, this curve thrusting less than the round arch.

Note 1.p.235. There remain only the lower parts of this little castle.

The bridge of the galendre at Cahors possesses projections of the piers up and down stream, and consequently flanking the relieving platforms at each side of the floor. Again a reason of defense was the motive of that arrangement, for everywhere that the bridges do not have that importance from the military point of view, if with sharp projections upstream, the piers are flat downstream, as for example at the bridge of S. Etienne at Limoges, described by M. Felix de Verneilh in the *Annales archaeologiques*.<sup>1</sup> That learned archaeologist, to whom we owe such precious works on the French monuments of the middle ages, has also observed that on several of these bridges of Limousin, those piers are often composed of only a facing of granite, in the midst of which is tamped a mass of earth. That was an economical method, whose use we have been able to prove, and that we think dates from a very high antiquity, for the remains of Roman piers presented the same peculiarity. The projecting ends of several bridges of Limousin give in horizontal section, neither an acute nor a right angle, but a pointed curve, which has the advantage of allowing the sliding of the running water, and of giving greater strength to these spurs; for it is clear (Fig. 6) that the section A presents a greater area than section B, consequently more weight and resistance.

Note 1.p.236. Vol. XX. p. 100.

Let us return to the bridge of Cahors. One will note (Fig. 5), that the external stairs leading to the towers are open on the side toward the city along the parapet, so that if the little castle were taken, by closing the gate of the tower E, the defenders could overpower the assailants and receive reinforcements from the city. But the stairs of the central tower

The first of these is the fact that the structure is a simple, unadorned, rectangular box, with a flat roof and a single door. The second is the fact that the structure is built of a material that appears to be a type of mud-brick or adobe, which is common in the region. The third is the fact that the structure is situated in a very open, flat area, with no other buildings or structures nearby. The fourth is the fact that the structure is very small, with a height of only about 10 feet. The fifth is the fact that the structure is very simple, with no windows or other openings except for the door. The sixth is the fact that the structure is very old, with a weathered and aged appearance. The seventh is the fact that the structure is very well-preserved, with no visible damage or decay. The eighth is the fact that the structure is very well-constructed, with a solid and sturdy appearance. The ninth is the fact that the structure is very well-proportioned, with a balanced and harmonious design. The tenth is the fact that the structure is very well-suited to its purpose, which is to provide a simple and functional shelter for the people who live in the region.



G is placed in an extension of the span; its entrance being placed under the passage, but masked as understood by the gate that closed that passage. The stairs of the ~~last tower~~ that is in communication with the battlements of the post I, and the post being closed at the side next the city was destined to present a first obstacle to the assailants that could make a descent on that bank. We give (Fig. 7) a birdseye view of the tower E on the bank opposite the city and its dependances. B Besides the little external castle A, a low defense formed the bridgehead on that bank and prevented landing near the tower, presenting a first obstacle on the road B. One will note that in this Fig. the arrangement of the machicolations with little round arches. Each arch is borne by a corble composed of four corbelled courses, that receive a masonry projection at the top, so that each arch forms a separate space with an opening into the upper story. Above the machicolations covered by great slabs are pierced 4 openings very close together, allowing crossbow fire at an angle more or less open. The first and second stories are each pierced by a single slot on each side. The span seen in our Fig. indicates the system adopted by the master of works to erect the structure. These spans are pierced parallel to the floor, at the height of the springings of the arches, by passages below which are seen the three holes intended for placing timbers across and a small floor forming a footway. The centerings of the arches were themselves set in fixing holes left visible. Thus the service of the masons was done on that footway across the spurs. On that foot bridge were piled the materials, taken up by movable cranes and set without requiring any other scaffolding. As stated by M. Felix de Verpeilh in the note cited above, the bridges of the middle ages were subject to be cut during the continual wars of those times; that was again a reason that compelled the constructors to give great thickness to the piers, for it was necessary that if it was required to cut the arch, the others should not fail. But also in provision for that case many stone bridges had movable wooden bays. We have recently seen that the bridge of Saintes had two portions of its floor of carpentry; one at the end at the suburb, the other at the city end. Certain stone bridges were furnished with actual drawbridges; such were those of Poissy, Orleans,





Charenton, the Guillotiere at Lyons, Montereau, etc. Also sometimes bridges only consisted of masonry piers with covered or uncovered floors of carpentry.

The examples just given sufficiently prove the importance of bridges during the middle ages as a means of communication and for defense. certain bridges placed at the junction of two rivers were connected with actual fortresses; for example, such was the bridge of montereau. About the year 1026 a count of Sens had caused the construction on the tongue of land found at the junction of the Yonne and of the Seine of a ~~very~~ strong keep, that served as support to a vast castle, at which adjoined the bridge crossing the two rivers. This bridge was further closed at its two ends by fortified posts. This entirety of defenses still existed in the 17 th century, as proved by the engraving of Merian.<sup>1</sup>

Note 1.p.238. Topog. Gallie.

The bridge of Orleans, on the arrangement of which remain some curious documents, as an example to be consulted from the point of view of the defense. Everyone knows how many feats of arms it witnessed during the siege undertaken in 1428 by the English. Now let us see at the moment of the siege, what were the works that made this bridge an important defense. Placed on the road connecting the North and South of France at the nearest distance from Paris, it was essential to fortify it well.

Then at the epoch when the English came to besiege Orleans, they followed the left bank and by Sologne on October 12, 1428, presented themselves before the rampart of Tourelles (Fig. 8 at A). That rampart was then only a work of earth and wood. On the 22 nd they took possession of it, and the inhabitants of Orleans abandoned the fort of Tourellse B to retire to fort S. Antoine F located on the island, after taking the precaution to cut the arch I ~~off~~ this part of the bridge. The English on their side cut the arch K. The men of Orleans hastily established a wooden rampart at the Belle-Croix at G. It was then in that narrow space that took place some of those feats of arms of that memorable siege. The fort of S. Antoine was preceded by a chapel D placed under the name of that saint, and an almonry E intended to receive pilgrims and delayed travelers. At H was the gate of the city, and at G the little castle.





After the raising of the siege, the work of the Tourelles was repaired, as well as the rampart A. This time the rampart was faced with stone, as shown by the plan on parchment drawn by lord Fleury, surveyor in 1543, and represented in fac-simile by M. Jollois in his *Histoire du siege d'Orleans*.<sup>1</sup>

Note 1.p.240. *Histoire du siege d'Orleans*, by M. Jollois, chief engineer of roads and bridges. 1833. Small folio, with letter to the members of the society of Antiquaries of France. 1834.

A second drawbridge was placed before the gate H of the city. A birdseye view (Fig. 9) presents the entrance of the bridge of Orleans, with its rampart on the left bank on the Sologne side, after the repairs made after the siege of 1428. later in 1591 and 1592<sup>2</sup> was rebuilt the rampart A with casemates in form of a ravelin with double tenailles, as recent excavations have recognized. But then the gate of Tourelles still existed. The rampart represented in our Fig. 9 was surrounded by a ditch filled by the water of the Loire, and furnished with a drawbridge falling parallel to the river.

Note 2.p.240. Accounts of the city.

A second drawbridge separated (as at the time of the siege) the rampart from the fort of Tourelles. Indeed in desiring to defend this drawbridge defended by the men of Orleans after taking the rampart, there perished the English captain and some cen at arms with him. Joan of Arc set fire to it by means of a boat loaded with combustible materials. The existence of this drawbridge in 1428 cannot then be doubtful. What was called the Belle-Croix located at C on the upstream spur of a pier of the bridge, was a bronze monument consisting of a crucifix erected on a pedestal decorated by a relief representing the Holy Virgin, S. Peter, S. Paul, S. James, S. Stephen, and the bishops S. Aignan and S. Euverte. Indeed it was a general custom to place a cross on the middle of bridges during the middle ages. Before the rampart of Tourelles was situated the monastery of the Augustines, that the inhabitants of Orleans demolished at the arrival of the English, to clear the vicinity of the little castle. Yet that monastery was itself surrounded by an enclosure and a ditch, could serve as an advanced work. Thus one only came before the entrance of the bridge of Orleans laterally, as before the entrance of





the bridge of the Salendre at Cahors.

One conceives what difficulties the feudal system must introduce in the construction of bridges. Neither practical science nor boldness, nor even resources were lacking when there was a question of establishing one over a wide stream of water, but rather the good will of the parties frequently interested in making difficult the communications from one country to the other. By the examples already given, one recognizes that if the bridges connected the two banks of a river, it was sought to accumulate as many obstacles to their passage as possible. On the construction of the bridge of Montauban exist complete and extended documents, that sufficiently prove what were the obstacles of every nature opposed to this sort of enterprises. After 1144 the count of Toulouse, Alphonse Jourdain, in giving to the citizens of Montauriol authority to found the city of Montauban on the banks of the Tarn, inserted in the charter of the foundation this clause:- "The inhabitants of the said place shall construct a bridge over the river Tarn, and when the bridge is built, the lord count shall agree with six experts, the best advisers of the inhabitants of the said place, concerning the tolls that shall be established there, so that the said bridge can be maintained and repaired."<sup>1</sup> But the growing city was too poor to put into execution such an enterprise. Then came the wars of the Albigenes, which reduced that province to the most frightful distress. Only in 1264 the consuls of Montauban could take such financial measures proper to ensure the construction of the bridge over the Tarn. In 1291 the city purchased the island of Castillons or Pissotte, to place there some of the piers of the structure. To one of the kings that had done most to establish unity of power in France, was it reserved to definitely commence the undertaking.<sup>2</sup> Philip the Fair, having come to Toulouse to terminate the differences existing between the count of Foix and the counts of Armagnac and of Comminges, charged with the construction of the bridge of Montauban two masters, Etienne of Ferrieres, royal castellan of the city, and Mathieu of Verdun, citizen, by subjecting all strangers passing over to Montauban to a toll, whose product should be exclusively reserved for payment of the cost of construction, and granting to the consuls for the same purpose a subsidy (1304).





Yet the king imposed as a condition the building on the bridge of three good and strong towers, "of which he reserved the property of the guard." Two of those towers must be erected at the ends, the third in the middle.<sup>3</sup> But it was only after vicissitudes of all sorts that the enterprise was completed; the means destined for the construction having been diverted by the consuls at different times. The works were only terminated in 1335. This bridge is entirely built of brick; its length is 821.8 ft. between the two abutments. Its pavement is perfectly horizontal and rises 59. ft. above the mean water of the Tarn. It consists of 7 pointed arches averaging 72.2 ft. of opening, and of 6 piers with a thickness of 28.1 ft., furnished with piers at both ends, and pierced over these spans by long pointed openings to facilitate the passage of water during floods. The bricks that served for the construction of this bridge are of excellent quality, and are 2.0 ins. thick, 15.7 ins. long and 11.0 ins. wide.<sup>1</sup>

Note 1.p.242. Art. 24 of the foundation charter of Montauban, Archives of Montauban, red book, folio back 105.

Note 2.p.242. See the excellent Note on the bridge of Montauban, given by M. Devais, Sr., in *Annales archéologiques*. Vol. XVI. p. 39.

Note 3.p.242. Archives de Montauban; file D, No. 16, book of oaths, folio 102.

Note 1.p.243. We owe these details to M. Olivier, architect of the Department.

The strongest tower was situated at the side opposite the city; these end towers were square, and were crowned by platforms with machicolations and battlements. The central tower was built behind the upstream projection, and was triangular, possessed screw stairs descending to a postern pierced at the level of the river on the city side. This stairs further gave access to the upper spur of the same pier at the level of the sills of the openings placed at the sides of the other piers. There was placed a crane supporting an iron cage intended for plunging blasphemers into the Tarn. According to the custom a chapel had been arranged at the level of the pavement, in the central tower, and was placed under the name of St. Catherine.

We shall merely cite here a certain number of stone bridges of the middle ages which merit consideration. These are the

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 stone of 1880 and 1890, which ruined the stone series.

Note 1. p. 244. *Theatre des antiquités de Paris. 1812. p. 287.*

As a result of that disaster the stone series was ruined in



bridges:- of Rouen, rebuilt at several times and demolished during the last century; of Andre, recently demolished and dating from the end of the 13 th century, although it was out and repaired several times during the 14 th and 15 th centuries; of Poitiers, with two very beautiful gates at its ends, and of which good engravings exist; of Nevers, demolished a few years since; of Tours,; of Auxerre, that possesses a beautiful tower at one end, and that abbe Lebeuf also saw; of Blois and of Ténnerre; of Sens, terminated at the city side by a considerable tower; of Macon, etc. It is certain that the feudal system was the greatest obstacle to the construction of bridges, at least over wide streams of water, but that in such a case the masters of the middle ages knew perfectly how to conduct the affair, when a sovereign will and sufficient resources set them to construct these works of public utility. The establishment of great bridges was usually due to the direct intervention of the sovereign, and it was indeed one of the material means for making effective the royal authority in the provinces. Thus we see that at Montauban, king Philip the Fair granting subsidies for the construction of the bridge, inserted the condition that the three towers should remain in the possession of his men.

It is well understood, that among all cities of the realm, Paris possessed several bridges from a very distant epoch. Du Breuil,<sup>1</sup> has left us the history of those bridges, modified, destroyed and rebuilt many times, both in wood and in stone. One cause of the ruin of bridges in Paris was the houses and mills permitted to be established on the piers and arches. The oldest of those bridges was the bridge change and the bridge petit-front, the first having a fort next the Rue S. Denis called the Grand Chatelet, the other next the Rue S. Jacques called the Petit Chatelet. Although these two little castles already existed from the time of Philip August, since the counts of Flanders and of Boulogne were held prisoners there after the battle of Bouvines, yet both these defenses had been rebuilt in great part, if not entirely at the end of the 13 th and the beginning of the 14 th centuries, after the terrible floods of 1280 and 1296, which ruined the two bridges.

Note 1.p.244. Theatre des antiquites de Paris. 1812. p. 233.

As a result of that disaster the Petit-Dont was rebuilt in





stone in 1314 by means of fine laid on the Jews. As for the bridge Change, they were contented to rebuild it in wood. The bridge Notre Dame, whose construction some historians place about the middle of the 14<sup>th</sup> century, was rebuilt at the cost of the city in 1413. This reconstruction was probably in wood and threatened ruin in 1440, since on Feb. 14 of that year, the parlement by a decree decided that this bridge should be entirely reestablished. This project was not followed by execution, and in 1498 the bridge Notre Dame fell with all the houses on it. "This bridge of wood," says the chronicler,<sup>2</sup> "had 13 paces in width and was supported on 17 rows of piles, each row having 30 piles, the thickness of each pile was a little over a foot, and they had 42 ft. in height. Those passing over this bridge did not see the river at either side, believed that they walked on the ground, and seemed to be in the middle of a street of merchants, for there was such a great quantity of all sorts of goods, of merchants and of artisans on this bridge, and further the proportions of the houses were so correct and equal in beauty and excellence of their work, that one could truly say, that this bridge merited having the first place among the rarest works in France."

Note 2. p. 244. Gouvin. De gestis francorum. Paris. 1522. 8 vo. folio 303, back. C. Molinère. p. 219 of Annales général de la ville de Paris. 1640. folio.

As a result of the disaster of Oct. 15, 1498, the people of Paris accused its magistrates of negligence and fraud, and they were placed in prison; after which most were condemned to fines more or less great. It was necessary to think of rebuilding the bridge Notre Dame. The two masters of works of the city hall, Colin of Chesnaye for masonry, and Gautier Hubet for carpentry, were charged with the undertaking, and to them were added Jean of Doyac, Didier of Felin, Colin of Biart, Andre of S. Martin and Jean Joconde. The two last were charged with the control of the cut stone. However contrary to the opinion of Sauval, Colin of Chesnaye and Jean of Doyac had been selected to superintend the work. "Sixteen men, taken from the different quarters of the city, worked under their orders, and as a mark of the sovereign power that they exercised, Colin of Chesnaye and Jean of Doyac carried white rods."<sup>1</sup>

Note 1. p. 245. Registres de l'hotel de ville, R. 1778. folio 1778.





(See *Recherches historiques sur la chute et la reconstruction du pont Notre Dame a Paris*, by M. Le Roux de Lincy. Library of School of Charters. 2<sup>nd</sup> series. Vol. II. p. 32).

Too many men were called to participate in the construction of the bridge Notre Dame; from this resulted changes in the direction of the work and different opinions, that delayed the enterprise. It is necessary to read on this subject the curious Notice published by M. Le Roux de Lincy, that gives at length the opinions requested by the municipal magistrates from various persons regarded as competent; some are in favor of piles, others regard them as useless; naturally the carpenters are in favor of piles, the masons for concrete. Yet this bridge was very good and very beautiful some years since, and it does not seem that it was necessary to rebuild it.<sup>2</sup>

Note 2.p.243. If it be necessary to refer to a note written on the cover of the red book of the Chatelet of Paris, the cost of the bridge Notre Dame at Paris was raised to 205,380 livres, 4 sous, 4 deniers Tournois. Sauval contests this figure without giving his proofs, and claims that the expense rose to 1,160,684 livres.

At the time of the rebuilding of the bridge Notre Dame, i.e., at the beginning of the 16<sup>th</sup> century, there was adopted that custom so much in favor today, of consulting a number of professional persons or of officious men in questions of public works; thus were accumulated opinions and papers, that certainly have a great interest for us today, but which on the whole were of little benefit to the work, and frequently caused useless expenses. In that the history of the construction of the bridge Notre Dame passably recalls that of many of our modern structures. Evidently less noise was made and less paper spoiled concerning our old bridges of the middle ages, nearly all begun with the smallest resources and continued without clamor, and with persistence until their completion. Yet those bridges were solid and sometimes very bold, since some of them, for example like that of S. Esprit, excite our admiration.

The piers of bridges of the middle ages were erected by means of coffer dams and rarely on piles. They sought a solid bed at the bottom of the rivers and built thereon. If piles were driven, this was upstream from the spurs, when the bot-





bottom was sandy and to prevent undermining. Thus were built the piers of the bridge Guillotiere at Lyons, and were founded those of the Petit-Pont at Paris, of the bridge of Arche, and of the bridge of Rouen. As for the arches, we have seen that those of bridges S. Benezet and S. Esprit are composed of rows of voussoirs abutted and not bonded. Some arches of bridges of moderate span, notably in Poitou, are constructed by means of transverse arches separated by a space covered by thick slabs below the floor, as indicated in Fig. 10. These transverse arches are then set in recesses in the piers and retain perfect elasticity. The rainwater that always soaks through the paving easily passes through the joints of those slabs, and does not effloresce at the haunches of the arches, as too frequently occurs when these are solid.<sup>1</sup> This system of arches has also the advantage of being light, of loading the piers less, and of being economical, since it employs one third less materials in voussoirs. The haunches over those transverse arches are constructed of rubble or of soft stone, and this can be very easily replaced without its being necessary to interrupt passage. The examples of bridges constructed after this system appear to belong to the beginning of the 13th century, or perhaps even to the end of the 12th.

Note 1.p.247. One will notice that most of the old bridges present alterations in the intermediate voussoirs, while those at the sides are intact, because they are more easily dried by the air.

To reduce the considerable expense caused by a bridge built with stone arches, the system was sometimes adopted of only building the piers of masonry on which was placed a wooden floor. Thus had been built the bridge crossing the Loire at Nantes (Fig. 11). On the projections of the piers of this bridge rose little houses let to merchants.<sup>2</sup> Between some of the piers had been established mills; for it is to be observed that nearly all bridges built very near populous cities or comprised within their walls carried houses, shops and mills. Space was scarce in those cities of the middle ages always entirely enclosed by walls and towers, and the bridges naturally being much frequented passages, was why men sought to place themselves on those ways. The bridges of Paris were covered by houses and formed actual streets crossing the river.





Even the establishment of these houses, to which the street authorities paid too little attention, contributed to the ruin of these bridges. If necessary to maintain the alignment of both sides of the way over the river, the structures were corbelled out, cellars and recesses were made in the piers, and the walls of these bridges must soon fall. When the demolition of the houses on the bridges of Notre Dame and of S. Michel at Paris was completed, it was necessary to repair the external surfaces and the haunches of the arches at the piers, each occupant having gradually excavated these haunches or changed these surfaces.

Note 2.p.247. This bridge still existed in that state about the middle of the 17<sup>th</sup> century; we do not know precisely at what epoch it was erected. (See Topog. de la Gaule, engraving by Merion.

Bridges of wood played an important part in the architecture of the middle ages, their establishment being easy and not expensive. We find again the tradition of Gaulish wooden bridges in Savoy. In that province to cross a torrent, on the steep slopes forming its banks were piled some great blocks of stone like abutments (Fig. 12), and then on these stones were laid trunks of trees, alternately perpendicular and parallel to the direction of the ravine, corbelled out. The intervals left between these logs were filled with stones, so as to form a heavy and homogeneous pier presenting sufficient resistance. From one pier to another were thrown two, three or four fir timbers or more, according to the width to be given to the floor, and on these logs were nailed cross pieces of wood. This primitive construction, daily still employed in Savoy, singularly recalls those Gaulish works mentioned by Cesar, and that were composed of trunks of trees placed at right angles in layers, between which were fillet blocks of stone. This procedure is merely piling, and cannot be regarded as a work of carpentry, and must date back to the highest antiquity; we mention it here to make known how certain traditions are perpetuated through centuries in spite of the improvements introduced by civilization, and how much they must always fix the attention of the architect.

This sort of works must seem barbarous in the eyes of the Romans, such excellent carpenters, and we still see them built





in our days in the midsts of peoples in contact with our civilization. Because that the works of men always retain something of their starting point, and that in the mature age of the peoples one can still find the trace of the first attempts of their infancy. Thus for example in the more elevated order, we see the carpenters at Rome execute considerable works of carpentry by the aid of very short timbers. That was a method adopted by the Roman armies. Not being able in a country to procure engines suitable to hoist very large timbers, they adopted combinations of carpentry that permitted the construction in brief time, of works of great height or of great extent. Those Roman traditions were still preserved among us during the first centuries of the middle ages, when difficulties of transportation and hoisting caused men to employ short timbers to execute carpentry works, particularly in the country. Villard of Honnecourt gives the sketch of a bridge built with timbers 20 ft. long.<sup>1</sup> (Old french text).<sup>2</sup> The means indicated by Villard of Honnecourt is very simple, and recalls the works of carpentry that we see shown in the reliefs of Trajan's column and of the arch of Septimus Severus. Villard erects two abutments of masonry (Fig. 13), to which he first fastens the ends B of the two angles A. The struts of these angles framed into the posts D are stiffened by the ties E. On the top beams of these angles he erects the posts G, H, maintained in all directions by X-braces. Second caps K connect the heads of those posts and are relieved by the braces L with ties as those beneath; then on these last caps are placed horizontal timbers to connect the two corbels and hold them in line. It suffices to nail planks on these beams. By taking for this work only timbers 20 ft. long, as Villard says, one can easily have a perfectly rigid floor 50 ft. long. That seems to our author to be a correct structure, that he surmounts by a gate at each end.

Note 1.p.249. Album de Villard de Honnecourt, manuscript published in fac-simile. Lassus and Barcel. 1858. pl. 38.

Note 2.p.259. "By this means one builds a bridge over a stream with timbers 20 ft. long."

As for wooden bridges placed across great streams, they are composed of rows of piles, usually single and tied together by strong braces at both sides. On these piles are set caps





caps connecting their heads, and then the floor relieved by braces. The piers are composed of single rows of piles, and have the advantage of opposing no obstacle to the current. Triangular guards attached upstream divert blocks of ice or floating bodies, that might injure the piers.

Like the Roman armies, those of the middle ages did not commit the fault of establishing permanent bridges on rivers for the passage of their men and equipment. In the *Chanson des Saxons*, Charlemagne caused the erection of a bridge on the Rhone:- "Barons," said he to the assembled chiefs:- (Old French poem).<sup>1</sup>

Note 1.p.251. *Chanson des Saxons*. Chapter 118.

A poet speaks, and we quote his views only as the expression of a general fact, accepted in the armies of the middle ages.

Wooden bridges never having but a quite limited duration, there remains to us no work of that kind preceding the 16<sup>th</sup> century, and we can obtain an idea of them only by vignettes of manuscripts, or engravings of the 16<sup>th</sup> and 17<sup>th</sup> centuries. If one desires to establish wooden bridges, either it is necessary to bring the piers nearer together, so as to give the spans of the bays of the floor but a small length, thus avoiding their deflection; or it is necessary to support these floors by struts sufficiently inclined to resist flexure, and then to extend the piers much above the level of the water; or the floors must be suspended by a system of trusses. The last system seems to have been frequently adopted during the middle ages. Let (Fig. 14) there be piers of three rows of piles spaced 39.4 ft. between axes; on the heads of those piers rising at most not over 6.6 ft. above the level of the water, stringers E are set on the heads of these piers, relieved at A by trusses B. These trusses are slightly inclined toward each other and are made stable by means of the upper cross beams C and X-braces D. On these stringers E are placed strong beams F and then the planks forming the floor. These works present great rigidity, but cannot exist long without deterioration, and were scarcely built except over streams with inconsiderable floods.

Du Breuil,<sup>1</sup> speaking of the bridge St. Michel at Paris, says that it was of wood and was built in 1334 by Hugues Aubriot, then provost of Paris. This bridge was covered by several ho-





houses. Bridge Notre Dame, built in 1414 according to the same author,<sup>2</sup> by the report of Robert Gaguin "was only of wood, having a length of 74 paces and 4 ft., in width 14 paces; at both sides and on which were built 60 houses of equal structure and height, and which after existing for only 92 years, fell into the river in the years 1499, on Friday, Oct. 25."

Note 1.p.252. *Theatre des antiquités de Paris*. p.241.

Note 2.p.252. *The same*. p. 243.

As we have seen previously, certain stone bridges possessed movable wooden bays, either to intercept communication from one bank to the other, or to allow boats to pass. These parts of the floors in carpentry were raised by means of frames with counterpoises, as still practised today, or indeed rolled on the stringers, the first were called lift bridges and the second rolling bridges.<sup>1</sup> The first were actual drawbridges. It is to be noted that the drawbridge as understood today, adapted to the gate of a city or castle, was only first employed about the beginning of the 14 th century, hinged bridges until then being arranged with counterpoises.<sup>2</sup>

Note 1.p.253. From the Latin word "positus."

Note 2.p.253. Old French poem. *Romans de Garin le Loherain*. Vol. II. p. 175. Edit. Techener. 1833.

If about the end of the 13 th century were already established drawbridges, these were isolated and were not attached to the gates themselves, as since practised. They formed a part of the wooden advanced works belonging to the barrier, but were not arranged in the masonry of the gates. Yet from a remote epoch were frequently employed bridges or foot bridges rolling on stringers, and which we give in elevation at A, (Fig. 15), composed of two parallel timbers B, under which were fixed rollers. A floor of planks was nailed on these timbers. Four pulleys C, whose pivots were strongly fixed in the side walls, received two chains fixed to the rings D fastened to the beams. These chains coiled on a windlass E, whose pivots turned in sockets likewise fixed to the side walls. Under the movable timbers B were fixed two beams G, on which rolled the little rollers. By turning the windlass from a toward c, the movable floor was moved forward across the ditch F, and came to rest on the pivot H; by turning it from b toward a, this floor was returned under the passage of the gate. The r





rear end I of the floor served as a counterpoise, and always allowed one to pass over the pit of the windlass when the bridge was drawn forward. A perspective view will better illustrate this very simple mechanism. To make it more intelligible, we have assumed that the side walls M in which are fixed the pulleys and the pivots of the windlass, are removed; we have likewise omitted the upper masonry of one of the flanking towers between which advances the footbridge. In the perspective Fig., the floor is assumed to be returned. Many of this sort of bridges were established in the Italian works of the 15<sup>th</sup> century, as stated by the very curious work of Francesco di Giorgio Martini,<sup>1</sup> and in our fortifications built at the time of the adoption of artillery.

Note 1.p.235. Trattato di arch.civ.et mil.di Francesco di Giorgio Martini, Accettosene del secolo XV, published for the first time by Chevalier Cesare Soluzzo. 1841.Turin.

One recognizes the use of different systems of bridges with counterpoises before the gates of the middle ages. Sometimes these bridges are arranged to be lowered, at other times to be raised.

In the provinces of the East and on the banks of the Rhine were frequently adopted balanced bridges presenting the arrangement indicated in Fig. 16. These bridges consisted of two principal beams A, connected by cross beams and X-braces. The front portion B of the floor was covered by planks. Two slots R were arranged in the masonry as indicated in Fig. 16 bis, and permitted the rear portions of the beams A to drop to the level of the masonry floor C, built under the passage of the gate. Then the floor B being horizontal, and to retain it in that position, under each beam was arranged a beam D sliding on two rolls E. When one desired to fix the floor and prevent it from descending, it sufficed to push the iron lever F, pivoted on a bolt at G whose fork passed between two pieces. T The lever being brought to the vertical line, as our Fig. indicates, the beams D slid into two holes I made at the top of the last pier. The sketch K indicates the arrangement of the fork of the lever in section. If one desired to drop the bridge, by pulling on the rope L the lever F was brought to f. Then the beam B left its hole I, and loosing the windlass M the weight of the front part of the movable floor became in-





inclined according to the line N O; the end P of the beams rose to p, and the passage was out. To bring the bridge horizontal, men bore on the windlass M, and with the hand on ascending the steps H and pushing the lever, the bridge was fixed. The spaces R (Fig. 16 bis) were sufficiently wide to allow the beams to swing and to facilitate the use of levers. There is still seen at Basle a gate arranged to receive a bridge constructed on this system. A portcullis S (Fig. 16) descended to the floor, either horizontal or inclined.

Other bridges were dropped or raised as shown in Fig. 17. The end A of the front floor fell on the last pier, when it was desired to allow passage, and to fix the bridge in that position, the beam B rolling on a fixed beam C was moved by the lever D. By pulling the lever to d, the floor was freed, and loosing the windlass T, the counterpoise G caused the bridge to rise, bringing the end B to b. A fixed inclined floor E led to the movable floor, when that was lowered by means of the windlass T.

These bridges were adopted at the time of the use of artillery so as to avoid the use of projecting beams and chains, to lift bridges, that the besiegers could destroy with cannon. They fulfilled the same purpose, and showed none of their mechanism externally. The balanced bridge (Fig. 17) consisted of two beams with cross beams and planks, each rear end of the two beams having a chain coiling on a windlass. We shall have occasion in Art. Porte to return to these movable bridges and particularly to drawbridges adapted to masonry.

The use of bridges on boats dates back to the first times of the middle ages; this was an ancient tradition never effaced. Reinhard in the life of Charles and of Carloman relates that the first of those princes caused to be established a bridge of boats on the Danube for use in the war against the Huns.<sup>1</sup>

Note 1.p.257. Latin text.

At the siege of Gaillard, Philip August caused a bridge to be built over the Seine, composed of piers inclined against the current, on which was placed a floor of carpentry. Three great boats were surmounted by high towers and defended that bridge.<sup>1</sup> In his chronicle, William Guiart speaks of a bridge of boats thrown across the Lis and retained by ropes:— (old French poem).<sup>2</sup>

At the time of Tatarov, the Duke of Anjou and his family

...and a crisis of faith began to show.

of "hats and gloves" on the second before Antarctica.

0670

allow them a right of access and make every one doing work  
within its boundary well and safe course of navigation and the  
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and to 7 days in 1968. In 1969, the number of days was 10, and in 1970, it was 12. In 1971, it was 15, and in 1972, it was 18. In 1973, it was 20, and in 1974, it was 22. In 1975, it was 24, and in 1976, it was 26. In 1977, it was 28, and in 1978, it was 30. In 1979, it was 32, and in 1980, it was 34. In 1981, it was 36, and in 1982, it was 38. In 1983, it was 40, and in 1984, it was 42. In 1985, it was 44, and in 1986, it was 46. In 1987, it was 48, and in 1988, it was 50. In 1989, it was 52, and in 1990, it was 54. In 1991, it was 56, and in 1992, it was 58. In 1993, it was 60, and in 1994, it was 62. In 1995, it was 64, and in 1996, it was 66. In 1997, it was 68, and in 1998, it was 70. In 1999, it was 72, and in 2000, it was 74. In 2001, it was 76, and in 2002, it was 78. In 2003, it was 80, and in 2004, it was 82. In 2005, it was 84, and in 2006, it was 86. In 2007, it was 88, and in 2008, it was 90. In 2009, it was 92, and in 2010, it was 94. 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bridge over the river, so that these forty

...the count of Abnoleia. "It was that-

on large boats (old French text). That was a bridge with a

...and the ... of the ...

Note 2. p. 256. The same. Book I. Chap. 10.  
Note 4. p. 256. Mem. de Phil. de Bonnier. Book I. Chap. 5.

When the Duke of Edinburgh attended the wedding of Prince Charles and Diana, he was wearing a tuxedo with a white shirt and a white bow tie. The Duke of Edinburgh is a member of the British Royal Family and is the husband of Queen Elizabeth II. The wedding of Prince Charles and Diana was a major event in British history and was watched by millions of people around the world.

and to defend the said or-  
ders; he ordered the workers from all parts to build a brick-

"...has been reduced to

In the History of the Rev. Charles W. Allen, Chaplain of the

1. The first of these is the fact that the majority of the population of the United States is of European descent. This is a fact which has been recognized by the government and the people of the United States for many years. It is a fact which has been recognized by the government and the people of the United States for many years.

Note 1.9.285. Alan Chartier. Hat de Charles VII. 1491.

nothing to turn right, wings to change out modified or a

...the works have been left to the mercy of the weather and the military engineers during the 10 to 15 years...

...more or less practical, employed to make the addition-



Note 1.p.258. Williom le Breton. La Philippide. Chant VII.

Note 2.p.258. Branche des royaux lignages. Verse 4883, et seq.

At the siege of Tarascon, the duke of Anjou and du Guesclin built a bridge of boats across the Rhone.

Froissart relates how the Flemings had established a bridge of "nefs and clayes" on the Escant before Audenarde.<sup>3</sup>

Note 3.p.258. Chronique de Froissart. Book II. Chap.58,170.

Philip de Commines tells how the count of Charolais and his allies threw a bridge of boats and casks over the Seine near Moret.

"He (the count of Charolais) caused to be brought 7 or 8 small boats on wagons and several casks with the intention of building a bridge over the river Seine, so that these lords should have no passage."<sup>4</sup> Farther on the same author thus describes the construction of a wide bridge thrown across the Seine near Charenton by the count of Charolais. "It was decided in a council, that there should be built a great bridge on large boats;(old French text).<sup>5</sup> That was a bridge with a movable portion, which the current moved as necessary, at the bank occupied by the enemy.

Note 4.p.258. Mem. de Philip de Commines. Book I. Chap. 6.

Note 5.p.258. The same. Book I. Chap. 10.

When the duke of Burgundy attacked the men of Ghent in 1452, he established a floating bridge over the Escant before Term-onde; he ordered the workmen from all parts to build a bridge on casks with ropes and planks; and to defend the said bridge caused beyond the water the building of a great rampart of timber and earth."<sup>6</sup>

Note 6.p.258. Mem. d'Olivier de la Marche. Book I.Chap.25.

In his Histoire du roy Charles VII, Alain Chartier relates that a party of French and Scotch built on the Loire near Fleche a bridge of wagons fastened together and covered by planks.<sup>1</sup>

Note 1.p.259. Alain Chartier. Hist de Charles VII. 1421.

These examples suffice to prove that bridges of boats were used during the middle ages,<sup>2</sup> either to serve a fixed post, or to facilitate the passage of armies. This sort of bridges greatly occupied the military engineers during the 16 th century; the works that have been left to us present a number of means more or less practical, employed to make the establish-





establishment of these bridges easy, and to rapidly throw them across to a hostile bank. They sought then to make the pontoons transportable, and for that purpose they were composed of several tight boxes that fitted into each other.

Note 2.p.259. See some of these bridges of boats and coaks reproduced in the treatise *De re militare* of Robert Volthurins.

#### PORCHE. Porch.

The earliest Christian churches, before the nave reserved to believers, possessed an open or closed porch, intended to contain catechumens and penitents. This arrangement was borrowed from the antique basilicas, which were generally preceded by an open portico. When there were no longer catechumens in the West, i.e., when baptism was given to infants, it was no longer necessary to prepare new converts before introducing them into the church, but the custom of porches no less remained as established, and in certain cases these even became very important additions, vast vestibules frequently glazed, able to contain a great number of men and intended for various purposes. It is necessary to recognize that the custom of constructing porches before churches weakened after the 13th century; many religious monuments were without them after that epoch, while until the middle of the 12th century, no cathedral, no monastic or parish church was conceived without at least one porch before the principal entrance.

Porches appear to have been adopted in our oldest churches of the middle ages in the primitive church; beneath the porches or vestibules of the basilicas were interred personages of distinction, emperors<sup>3</sup> and bishops. Thus the custom of censuring those places and of chanting litanies there was retained in some dioceses, for it is necessary to observe that before the 12th century, the ecclesiastical laws forbade the interment of the dead in the interior itself of the church. Beneath the porches were then placed the baptismal fonts and fountains in which the believers could make their ablutions before entering the nave; exorcisms were also practised under the porches. It was forbidden to hold courts there and to assemble there for temporal affairs. There were exposed on certain occasions relics and sacred images. "The porches of churches," says Thiers, "are sacred places:— 1, because of the relics or





images there; 2, because they are the place of burial of believers; 3, because they are intended for sacred purposes; 4, because they form a part of the church; 5, because they are so called by the councils of the ecclesiastical authors." <sup>1</sup>

Note 3.p.259. See Eusebius. Book IV. Chap. 80. De vita Const.

Note 1.p.260. Diss. sur les porches des églises. Chap. VII. p.67. Summary.

William Durand observes "that the porch of the church signifies Christ by whom opens for us the entrance to the celestial Jerusalem; it is also called portico from portal, or from what is open to all (a portu)." <sup>2</sup>

Note 2.p.260. Rational. Book I. Chap. 1. Sect. 20.

Yet the porches of churches did not always retain during the middle ages that sacred character; we have the proof of it in the complaints of chapters or the religious on the subject of the secular uses that they were made to serve. In the collection of the decrees of the parlement of 1292, we find a complaint of the dean of the chapter of Roze against the castellan, who for a long time had held his courts under the porch of the church. It was enjoined on the bailiff of Vermandois to forbid the said castellan to hold in future his assemblies in that place, notwithstanding that he had long held them there, since it is fully proved that this porch forms a part of the church and serves as a cemetery. <sup>2</sup>

Note 2.p.260. Les Glan. Year 1292. Decree 2.

It was probably to prevent those abuses that the great establishments of Cluny and Cîteaux erected before their churches porches absolutely enclosed from the beginning of the 12th century; besides those porches must serve for ceremonies and customs that required an enclosure, as we shall soon see. A number of porches of cathedral and parish churches even served for markets, and the ecclesiastical authors too frequently rise against that abuse for it not to have been common. Again today we see temporary booths established in certain places on days of fairs, and that the chapters tolerated there the sale of religious articles.

The primitive porches of the middle ages in the West, i.e., those built from the 8th to the 11th centuries, generally present themselves under the form of a portico occupying the entire width of the church and having but little depth. Yet





certain porches of churches dependant on monasteries or even collegiate churches are arranged beneath a tower placed before the nave. Such was the porch of the abbey church of S. Germain-des-Prés at Paris, of which remain but very few traces, and that dates from the Carlovingian epoch; such are also those of the abbey church of S. Savin near Poitiers, of the cathedral of Limoges and of the collegiate church of Poissy, all three belonging to the 9<sup>th</sup> and 10<sup>th</sup> centuries. Then these porches formed a protected entrance and were sometimes preceded by a ditch, like that of S. Savin, for example. The porches of the church of Notre Dame du Port at Clermont, of Chamallieres, of S. Etienne of Nevers, of the cathedral of Clermont, are built on a rectangular plan and are enclosed; they should be crowned by two towers. Some Carlovingian churches, like the Basse Oeuvre of Beauvais, were preceded by porches and vaulted, by porticos covered by visible carpentry, into which the nave and its side aisles opened widely. About the end of the 12<sup>th</sup> century, most of these primitive arrangements were profoundly modified, and the general tendency was to suppress porches placed before the principal facade in order to reunite them to the naves, which causes one to believe that then the ceremonies for which the porches were reserved fell into disuse. A little later, about the middle of the 13<sup>th</sup> century, on the contrary, men built many porches before the side entrances of churches, and notably of the cathedrals as at Chartres, Bourges, Chalons-sur-Marne, and then about the end of this century and during the 14<sup>th</sup>, built them before the principal entrances; but all these porches are then open, and are merely shelters intended for believers at entering or leaving the church. They no longer have the sacred character, that one observes in the primitive porches, and rarely serve as places of burial.

To follow a systematic order, we shall divide this Article into closed church porches, ante-churches or narthexes, open porches under towers, annexed open porches, and porches of secular structures.

#### PORCHES FERMÉES. Enclosed Porches.

We do not think that there were porches in France earlier than that of the Latin church of S. Front of Perigueux, whose





traces are still recognized. That porch of rectangular form was 33.8 ft. long by 31.7 ft. deep. It was covered by carpentry in two slopes with a masonry gable in front. A wide round archway formed its entrance. Of its very simple external decoration remain only fragments. This porch preceding the 10<sup>th</sup> century is described and engraved in the work by M. Felix de Verneilh on *Architecture Byzantine en France*.<sup>1</sup> This arrangement of a hall preceded by a front gable is contrary to the form adopted for the porticoes of the first Latin basilicas, and indicates a modification already very old in the plan of porches on the soil of France, a modification whose starting point cannot be known to us for lack of existing monuments; it is no less important to state, since we see that after the 10<sup>th</sup> century, most abbey churches are preceded by vast enclosed porches, presenting an actual ante-church, frequently in two stories and that must respond to new needs.

Note 1.p.261. Paris. 1851.

The order of Cluny took possession of this arrangement and made it the motive for monuments remarkable in every respect. One of the earliest closed porches belonging to that order is that of the church of Tournus; it consists (Fig. 1) in the ground story of a central nave of three bays with side aisles. That central nave is covered by cross vaults perpendicular to the side walls, and resting on transverse arches A. One enters this narthex by a doorway B, opening on a court preceded by a fortified enclosure. The facade itself of the porch was defended. Two towers rise on the two first bays C. From the narthex one enters the church by the doorway D and the two arches E. Great cylindrical isolated and engaged piers receive the imposts of the vaults. In the first story this vast narthex forms a church with elevated nave covered by a tunnel vault and side aisles with half tunnel vaults (Fig. 2). Slots open in the lower part of that hall, lighted by windows pierced in the walls of the high nave and in the front gable. The transverse section that we give here is taken looking toward the entrance. At A are shafts of the two towers.<sup>1</sup> The entire structure is built of rubble, roughed or plastered. Next the church an arch is pierced in the gable wall at the level of the floor of the second story, and it allows one to see what occurs in the nave. The same arrangement is found again at





Vezelay. In the abbey church of the order of Cluny, these upper narthexes, these chapels placed over the great enclosed porch, were generally placed under the name of the Archangel S. Michel. But what was the purpose of this hall or chapel placed over the narthex? In the ancient pontifical of Chalons-sur-Saone is read: - "(Latin text)." Was this upper chapel intended for the penitents? At Vezelay the second story of the porch only extends to the back and over the side aisles; it was then possible for penitents or pilgrims placed on the ground floor to hear if not to see the divine office said in the gallery; at Tournus it would have been necessary for the penitents to ascend into the upper narthex to hear the mass. At Cluny the porch or ante-church, which was not less than 114.8 ft. long by 88.6 ft. wide, but whose erection does not date beyond the beginning of the 13 th century, possessed neither a second story nor a gallery, but an altar and a pulpit found places near the entrance doorway of the basilica; from that pulpit as from the gallery of the narthex of Vezelay, were not the numerous pilgrims filling the porch or even penitents, prepared by being permeated by the sanctity of the place, before then were permitted to enter the church? The attendance was such in the 12 th century in the churches of the order of Cluny on certain occasions, that one well understands why the religious did not open at first the doors of the church to the multitude waiting, in order to avoid disorder, that would not fail to arise in the midst of such mobs. Those great narthexes seem to us to be places of preparation; also perhaps they served to shelter the pilgrims, that came from afar and arrived before the opening of the doors, and had neither the means nor the possibility of obtaining a refuge in the city. On the night preceding certain great festivals at Rome, does not one see people from the country pass the night under the porticos of S. Peter?

Note 1.p.262. For more ample details, see the engravings made from the drawings of M. Questel in the Archives des monuments historiques, published under the auspices of his excellency, the minister of State.

The porch of the abbey church of Tournus dates from the 11 th century; it is the oldest among those belonging to the order of Cluny.





The nave of the existing Cluniac church of Vezelay, probably built by abbot Bartaud and consecrated in 1104, originally possessed only a low porch of small depth, whose traces are seen at the north side. This nave was restored and even rebuilt in great part by abbot Renaud of Semur about 1120.<sup>1</sup> The porch must have been built a little after the death of that abbot, either by abbot Alberic or by abbot Ponce, from 1130 to 1140,<sup>2</sup> for after that epoch the monastery of Vezelay until about 1160 had to sustain such ruthless struggles, either against the counts of Nevers or against its own vassals, that it is impossible to admit that during those calamitous times, the religious could have had leisure to undertake such a vast structure. Besides the archaeological characteristics of the architecture of this porch assign it to the date from 1130 to 1140.

Note 1.p.264.

This abbot was the nephew of S. Hugues, abbot of Cluny; he was made archbishop of Lyons about 1126, and was buried at Cluny. His tomb was placed near the column nearest the main altar and bore this inscription:- "Here rests Renald II, formerly abbot and rebuildier of Vezelay, and then archbishop."

The construction of the porch of Vezelay is certainly one of the most remarkable works of the middle ages. This porch is enclosed and like that of Tournus, presents an ante-church 82.0 ft. wide by 68.9 ft. long inside. We give its plan (Fig. 3), at A at the level of the ground story and at B at the level of the galleries, for the space C D rises from the ground; the side aisles E alone formed galleries and the area F was a large gallery over the old doorway of the nave. One could ascend to the galleries only by two stairs G, partly of wood and partly made in the thickness of the front wall. Two towers rise on the two first bays H of the side aisles. Above the level of the galleries about 1240 was rebuilt the great window K (Art. Pignon, Fig. 9), probably to light better the great hall. At the level of the gallery, three openings L open on the nave of the church (Art. Architecture Religieuse. Fig. 21). An altar was formerly placed at O on that gallery. The instructions to pilgrims or penitents gathered on the ground floor could be given from the top of the balustrade enclosing the gallery at M.<sup>1</sup> Before the construction of the

The first section of the road is a very fine example of the work of the first section of the road. The second section is a very fine example of the work of the second section of the road. The third section is a very fine example of the work of the third section of the road. The fourth section is a very fine example of the work of the fourth section of the road. The fifth section is a very fine example of the work of the fifth section of the road. The sixth section is a very fine example of the work of the sixth section of the road. The seventh section is a very fine example of the work of the seventh section of the road. The eighth section is a very fine example of the work of the eighth section of the road. The ninth section is a very fine example of the work of the ninth section of the road. The tenth section is a very fine example of the work of the tenth section of the road.



porch, the three openings next that gallery were windows without glass, like all other windows of the church; that at the middle terminated in a half dome and perhaps received a statue. The principal doorway C of this porch is surmounted by a great relief representing Christ surrounded by the 24 old men and the elect in the tympanum, the Magdalen perfuming the feet of Jesus, and the resurrection of Lazarus on the lintel. The internal capitals are very richly sculptured with a very remarkable refinement in execution. Formerly the great vaults as well as those of the galleries were entirely painted. We present (Fig. 4) a perspective view of the interior of this porch, taken from the gallery across the facade. One will note that the vault over the gallery has pointed arches. This is perhaps the first example in France of that kind of construction, the other vaults of the narthex being much stilted cross vaults. (Art. Ogive, Figs. 3,4,5). The entirety of this interior is of admirable proportions, and the bays are studied by a consummate master. (Art. Travee). It does not appear that anyone was ever buried under that porch, and the excavations that we have even made there show no trace of burials.

Note 1.p.265. See the transverse and longitudinal sections of this porch in *Archives des monuments historiques*, published under the auspices of his excellency the minister of State. Also see the reduced transverse section of the porch of Vezelay in *Art. Architecture Religieuse*, Pl. 22.

The vestibule, narthex or closed porch of the mother abbey church of Cluny was even more vast than that of Vezelay, but it possessed neither tribune nor vaulted upper galleries. It was a great hall with side aisles reached by two flights of steps 42.7 ft. wide. Two towers rose before the five bays contained by the narthex, leaving between them an open porch. The enclosed porch of Cluny was 114.3 ft. long by 88.6 ft. deep inside; fluted piers after the fashion of upper Burgundy, Lyonnaise and of upper Marne, supported the vaults of the side aisles. Above rose a triforium also with pilasters, then the high cross vaults with pointed arches, and round arched windows in the tympanums. The crowns of the upper vaults were 108.3 ft. above the pavement. It was the twentieth abbot of Cluny, Roland I, who erected in 1220<sup>1</sup> this magnificent narthex, of which our perspective view (Fig. 5) can only give a faint idea.





All the arches of this structure are pointed, except the windows covered by round arches. At the back is seen to appear the old facade of the church, with its principal doorway and its blind upper gallery, at the middle of which were pierced the openings, that lighted the chapel of S. Michel, made at the expense of the thickness of the wall and supported by a corbel at the side next the nave. Four figures of apostles in relief decorated the tympanum under the side arch of the great vault of the porch.

Note 1.p.266. See Mabillon. Ann. ord. S. Bened. Vol. V. p.252.

Why was this vast porch erected only in 1220? Must one see here the execution of a new programme, or rather the postponement of a primitive programme? Almost a century earlier, the abbey church of Vezelay built an enclosed narthex of nearly similar dimensions in place of a low and narrow porch. These great enclosed porches were then not foreseen in the first arrangement of the Cluniac churches, and still at Tournus the narthex is of the primitive construction or nearly so. It was only during the second half of the 12 th century that the Cluniacs of Charite-sur-Loire likewise erected an enclosed porch of dimensions at least as vast as those of the mother church of Cluny. There is then reason to believe that this programme was adopted by these religious only during the 12 th century, and that it was designed to provide for the extraordinary multitudes of believers in the churches of that order; which is no reason for surprise, when one thinks that at that epoch, the Cluniac churches were the places most venerated in all Christendom, and as the king Louis VII said in the charter given to the monastery of Cluny, the noblest members of his realm. The extent and richness of the enclosed porches of the great Cluniac churches were not surpassed nor even attained in all other cathedral or monastic churches.

The Cistercians also established enclosed porches before their churches, but these were less extensive and low, affecting simplicity as much as those of Cluny manifested the luxurious tastes of their founders. Besides those porches of Cistercian churches are not absolutely enclosed like those of the Cluniac churches; they generally present openings to the free air like the arcades of the porticos of the castles, and resemble rather a deep portico than a hall. Thus it seems that

1. The first building is situated on the left bank of the river, and is a small, single-story structure, built of brick and plaster. It is a simple, rectangular building, with a gabled roof and a small porch on the left side. The building is surrounded by a low wall, and there is a small garden in front of it. The building is situated on a slight rise, and the river is visible in the background.



S. Bernard desired to return to the arrangement of the primitive church, and to restore the narthex of the basilicas of Christian antiquity. These Cistercian porches are very low, covered by a shed roof and are never flanked by towers like the porches of the Benedictine churches. (Art. Architecture Religieuse). Pierced by a single doorway opposite ~~that of the~~ <sup>that of the</sup> nave, they are lighted on the facade by arches neither glazed nor closed, opening above quite an elevated base. Such is also the perfectly preserved porch of the Cistercian church of Pontigny, whose plan we give in Fig. 6. This porch was built in the second half of the 12<sup>th</sup> century,<sup>1</sup> and consists of three bays in width and two in depth; it occupies only the width of the great nave. At the two sides A are two enclosed halls intended for the needs of the abbey. Cross vaults without ribs cover this porch and rest on the two columns. An external doorway B corresponds to the principal portal of the nave and at both sides B open on a wide and high base two arches divided by little coupled columns. All this entirety, including the two halls, is covered by a shed roof with half hips at the two ends. Above the roof of the porch is pierced an enormous window in the great gable; it lights the nave. On the exterior, the construction of this porch is of a cold and gloomy appearance. In the interior the capitals of the columns are decorated by sculptures of entirely Puritan simplicity, and the tympanum of the doorway of the church is only decorated by a cross in relief. Fig. 7 represents the longitudinal section of the porch of the church of Pontigny, and it shows in the full 12<sup>th</sup> century, how far the monks of the order of Cîteaux were from the splendid programmes adopted by the Cluniacs. In the Department of Aube, the church of the village of Moussey possesses a complete porch established in Cistercian principles. It forms a low shed, not vaulted, at the middle of which opens the doorway; two arches at right and left are placed on a wall and light the shed. These arches are round, doubled, resting on a little pier or column. A fifth similar opening is over the south side. The construction is extremely simple, and appears to date back to the origin of the order of Cîteaux.<sup>1</sup> Yet the dryness and coldness of these examples were not long imitated, and from the beginning of the 13<sup>th</sup> century, the porches of the churches created under the inspiration of the





monks of Cîteaux were already impressed by the most elegant taste. There still exists at Montier one of these enclosed porches like a portico, erected on the principles of Cistercian porches. As at Pontigny, the porch of the church of Montier, which dates from the beginning of the 13<sup>th</sup> century, opens externally by a central doorway accompanied by four arches, two at right and left, placed on a wall. These were closed by stone tracery in the 15<sup>th</sup> century. A pretty porch presenting a similar arrangement still precedes the facade of the church of Tousy. It dates from about 1230. This porch (Fig. 8) is only a narrow portico, quite recalling a cloister portico; it is pierced by three doorways between which rises an arcade placed on a wall. At A we give the detail of the plan of this arcade. Three pointed archivolts rest on the piers B and the twin columns C. Small round arches with tympanums form the heads and rest on the small single columns D. Fig. 9 gives the half elevation of this porch, as well as its section E made through the tympanum.<sup>2</sup> Many of these porches in the form of porticos and with shed roofs were erected in the 13<sup>th</sup>, 14<sup>th</sup> and 15<sup>th</sup> centuries, before the facades of little older parish churches; but generally they are of extreme simplicity, only composed of little piers of stone or posts placed on a wall and supporting a roof with a single slope. These churches were always surrounded by cemeteries, and the porches then served for giving absolution, and the shelter of persons attending the burial. As shown by the last example, they further only formed an enclosure easily entered, the more so that the doors in many cases do not seem to have been furnished with leaves. One of the largest among this sort of enclosed porches is certainly that preceding the facade of the little monastery church of S. Pere-sous-Vezelay, and which was erected about the end of the 13<sup>th</sup> century, rebuilt during the 14<sup>th</sup> and 15<sup>th</sup>. This porch opens on its front by three openings that do not seem to be arranged to receive grilles or wooden leaves, laterally it was lighted by glazed openings placed on a wall, so as to protect the believers from wind and rain.

Note 1.p.269. The church of Pontigny was in great part erected at the cost of Thibault the Great, count of Champagne, from 1150 to 1190.

Note 1.p.271. The plan of this church is given in the work

of M. 47000, Voyage archéologique dans le département de la

1887.

These results were furnished to us by the  
 object, one of the most difficult archaeological objects. They  
 were made with a microscope.

This object is covered by six cross walls resulting in six  
 small cells and two larger ones. A small basin from the west  
 limit of the construction is placed at the foot of the  
 central part of the object. Other details were placed here  
 and there. The figure is relief of the figures and  
 contained inside the object; there are a small number of

of the locality and of the site. Unfortunately this object  
 is not very well and beautiful, and  
 has been ruined, and presents only a few remains. The  
 object of the site is a kind of construction from the absolutely  
 earliest remains of the figures and the other objects. It is  
 then particular in the object that the object is in the  
 vicinity of the object. It is not a kind of object of the  
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of M. Arnaud, *Voyage archæologique dans le département de l'Aube. 1837.*

Note 2.p.271. These drawings were furnished to us by M. Sauvageot, one of the most skilful architectural engravers. They were made with minute accuracy.

This structure is covered by six cross vaults resting on engaged piers and two isolated piers. A tomb dating from the earliest epoch of its construction is placed at the left of the central doorway of the church. Other burials were placed beneath its pavement. The figures in relief of the donators are sculptured inside the entrance; these are a noble personage of the locality and of his wife. Unfortunately this structure, which must originally have been very rich and graceful, has been much mutilated, and presents only repaired remains. The porch of S. Pere is a sort of transition from the absolutely enclosed porches of the Cluniacs and the open porches. It rather participates in the church than the exterior; it is also evidently a sacred place. It brings us to speak of porches freely open, although still having considerable importance with regard to the religious edifices that they precede. But before occupying ourselves with open porches, we should not omit here a monument of great interest, although of quite recent date. This refers to the porch of Ry.<sup>1</sup> This church is entirely without style, a rectangular hall of the 15 th century without character. Beside the nave is built at the south side a closed wooden porch, richly carved and in perfect preservation. We give its plan (Fig. 10) and a perspective view (Fig. 11).<sup>2</sup> This pretty porch dates from the first half of the 16 th century; it is entirely constructed of oak and rests on a stone base. The carpentry has a pointed ceiling with visible tiebeams only at the hip as shown by the plan. The entrance opening appears to have never been finished with leaves, nor the openings with grilles. It is then a shelter looking out on the cemetery, and that seems to have been erected by a lord of the place, perhaps to serve for a burial place. Its sculpture is very delicate and of the best of the epoch of the Norman Renaissance. This little monument, that now counts more than three hundred years of existence, and which is known to be able to endure more than a century longer, shows how carpentry works established with care and in good conditions can be





preserved in the open air.

Note 1.p.273. Ry is a village situated 12.5 miles from Rouen.

Note 2.p.273. Again to M. Sauvageot we owe the drawings of this porch.

In examining the vignettes of manuscripts of the 15 th century, it is easy to prove that there existed many of these porches in carpentry, principally in the northern cities. These porches in wood were always painted and enhanced by gilding. They generally consist only of two side walls supporting the posts and a ceiling with roof. Although sometimes they appear to be suspended over the doorways like canopies, and only supported by corbels.

#### FORCHES OUVERTS. Open Porches.

Well known are the quarrels, that during the 16 th century, arose between the abbots of Vezelay and the bishops of Autun. The latter then constructed the beautiful cathedral, that we still admire today, and that by its character and its particular style summarizes the religious architecture of upper Burgundy, upper Maine and a part of Lyonnais.

The cathedral of Autun was completed with difficulty about 1140, when was erected the vast porch before its principal facade. This porch covers a flight of steps extending the width of the nave and side aisles. It is surmounted by two towers with a hall in the second story, formerly covered by visible carpentry. Closed at the sides, the porch of S. Lazare of Autun opens before the central entrance of the church by an enormous tunnel vault enclosing the archivolt of the portal. This arrangement has a grand effect, the more that the lintels and tympanum of this doorway are covered by figures sculptured in a strange style, energetic and with remarkable execution. Fig. 12 gives the plan of this porch in the ground story at A, such as it was conceived and very probably executed at first, and at B as it was rebuilt about 1160. Now the lateral enclosing wall corresponding to the wall C is pierced by pointed arches with arcade borne on little columns, surmounted by windows not glazed. Two towers rise on the two first bays of the side aisles. At the origin (see plan A) the porch must have extended before the side doors D, and the tunnel vault covering it rested on the two thick walls, with two lateral openings E. Today the bays of the side aisles are covered by cross vaults.





Two screw stairs, opening to the nave at both sides of the central portal, ascended to the upper hall. The transverse section made on a b, c d, (Fig. 13), indicates at A the primitive arrangement of the porch, and at B the present arrangement. One will note the great vaulted niche with half dome reserved in the gable on the second story and flanked by two doors.

That hall in the second story merits a careful examination, for it indicates a programme peculiar to churches in that part of France. We have seen that at Vezelay, there was likewise over the great doorway quite a deep niche to receive a seated colossal statue, or even a little altar. At Cluny over the central doorway was a niche opening to the interior, with a corbel in the form of a projecting balcony, in which was a little altar placed under the name of S. Michel archangel. On the interior of the facade of S. Andoche of Saulieu is seen an analogous arrangement, and that church is contemporaneous with the cathedral of Autun. The substructure of the great niche of the facade of the cathedral of Autun is now engaged in the depth of the vault of the porch, and the two doorways accompanying it at right and left give exit to two little screw stairs, that have their landings below the floor of the hall. Evidently these two doors could not open to the exterior but must open on a floor; then from the construction of the nave had been projected a porch more or less deep with a second story. This hypothesis is more admissible, since there still exists over the niche the rakes of a low roof, that must cover the hall of that projected and unfinished porch, or soon replaced by the existing porch. The primitive porch, according to the arrangement of the rake of the old roof, only covered the great doorway and did not extend before the side aisles. When it was decided to construct the great existing porch, that comprises the entire width of the facade, it was necessary to raise the rakes of the roof and to obstruct the lower part of the three windows, that light the vault of the nave and are pierced in the great gables. Our transverse section (Fig. 13) then indicates at A the presumed arrangement of the primitive porch, and at B that of the existing porch. After this modification, the great niche in part engaged in the vault and losing a part of its height, no longer seems to have been utilized,





for the upper part of the porch was never finished; but this niche, decorated by pretty fluted pilasters, pierced by a very small opening looking into the nave, accompanied by these two doors communicating with the two screw stairs, certainly had a purpose. Would it contain an altar, like the internal niche of the facade of Cluny, or like the external one of the porch of Vezelay? That appears probably. But for what ceremonies were reserved those altars placed in the second story over porches or on an internal tribune? It is what no text informs us till this day.

In our section the dotted line C indicates the level of the external ground before the porch; one takes into account the grand effect produced by this vast covered flight of steps, terminated by this portal so broadly composed. The existing porch is evidently an imitative work, perhaps inspired by the porch of Vezelay, but which alters the primitive character of the monument, recalling those charming Greco-Roman structures of the 5<sup>th</sup> century discovered by count Melchoir de Vogue between Antioch and Aleppo. It is not doubtful that the masters of the 12<sup>th</sup> century from certain provinces of France saw those monuments, and imitated them in not only the mouldings and ornamentation, but also in certain general arrangements. Some of these Greco-Roman churches further possess porches with a gallery above the lateral towers.

We believe that we should give (Fig. 14) the plan of the upper hall of the porch of Autun with its two stairs and doors. The blind arcade borne on pilasters in the interior behind the niche, and that ranges with the triforium of the nave, is pierced by two openings A beside the stairs. For what are these openings? As for the doors B, they open beneath the roofs of the side aisles of the nave. These oddities prove that we are ignorant of under what religious requirements were erected the porches of the 12<sup>th</sup> century, which were more or less subject to the influence of the order of Cluny; there is a subject for studies, that we recommend to our archaeologists, and that appears to us worthy to fix their attention. Evidently at that epoch, the porches had a considerable importance, and such important appendages would not have been constructed before a great number of monastic, cathedral or parish churches, unless they must respond to a serious need. We will state fur-





further, that these porches with rare exceptions arose within a quite limited space of time, from 1130 to 1200.

At F is traced the plan of the upper hall of the primitive porch of Autun, and at G is the plan of the vault after the reconstruction of the existing porch; a construction never completed, as we have stated. The cathedral of Autun is not the only one, that was preceded by important porches with a second story. It was only in the 13 th century during the rebuilding of these great monuments of our cities, that were entirely renounced these dependances. The cathedral of Puy-en-Velay possesses an open porch of the 12 th century with a great flight of steps, or rather the church itself was only an immense porch, whose steps reached the foot of the altar. The front part of the cathedral of Chartres still shows the plan and arrangement of a deep porch with upper hall, that was suppressed only in the 13 th century.

The abbey church of S. Denis possessed a vast narthex very open toward the nave and closed at the external side, but surmounted by a vaulted hall. The little church of S. Leu d'Esserent still retains its enclosed porch of the 12 th century with upper hall; none those structures date from 1140. But here (Fig. 15) is a porch earlier than the existing porch of the cathedral of Autun, and that presents an even freer arrangement, no less monumental. It is the porch of the church of Chatel-Montagne. The construction of this porch is very little later than that of the church; it dates from about 1130,<sup>1</sup> and retains an entirely Romanesque appearance. Placed on the top of a precipice, the porch of the church of Chatel-Montagne is preceded by a flight of steps 16.4 ft. wide, with a yard; it presents opposite the nave a great arch and before the side aisles two narrow arches opened at the side to give greater strength at a to the masonry that receives the weight of the gable. At the sides are opened two other wide arches leaving entire the buttresses that abut the structure of the nave. A stairs b taken out of the southern side aisle of the nave permits one to ascend to a hall over the porch, and that opens to the interior like a gallery. Fig. 16 presents the external elevation of this porch, that with its upper construction forms the facade of the edifice. The character of this architecture is entirely impressed by a good style, whose elements we find





again in the Greco-Roman architecture of the suburbs of Antioch. But here the materials (granite) are small, while those that served to erect the Byzantine monuments of Syria are large and widely jointed. The open windows in the upper arches of this facade light the gallery; the middle arch forms the outline of the internal tunnel vault. We give (Fig. 17) the longitudinal section of this porch with the beginning of the nave, and (Fig. 18) its lateral facade.<sup>1</sup> If the construction is simple and well arranged, one will note that the proportions are most happily established. One recognizes in that pretty edifice the trace of a very advanced and delicate art, carefully studied, and yet the church of Chatel-Montagne is located in one of the wildest provinces of France. Today in those mountains can scarcely be collected some workmen able to execute the most common construction. But the provinces of the Centre in the 12 th century were a centre of art, active and developed, possessing a school of architects that has left us charming compositions, constructions well understood, solid and in an excellent style.

Note 1.p.279. The Romanesque style was retained in that part of France much later than in the provinces of the North and East. After the end of the 11 th century quickly attaining very great perfection, it was not mixed with Gothic influences about the middle of the 12 th century, like the Romanesque of Burgundy, of upper Marne, Champagne and Berry. During the second half of the 12 th century, the monuments of Auvergne are fifty years late.

Note 1.p.280. The drawings of this porch were furnished to us by M. Millet, charged with the restoration of the church of Chatel-Montagne.

These architects were then certainly religious, and their school followed the decadence from which could not escape the old monastic orders at the end of the 12 th century.

The hall of the second story of the porch of Chatel-Montagne forms a gallery, from one can see what passes in the nave, while in the examples previously given, these upper halls are almost entirely closed next the nave. For what purpose was this gallery intended? We think that like all closed halls it formed a special chapel, and that an altar was placed against the balustrade, for we also see on the gallery of the church of Montreal in Burgundy an altar of the end of the 12 th century

as arranged. (Arch. Tribune). But (in the 12th century) the  
 church was not built with the same plan as the  
 choir these spaces; the choir was in the choir or on  
 the left side, and on the right side the choir was  
 Some authors have claimed that these galleries were reserved  
 for women, but the actual evidence is not sufficient to show  
 that they were reserved for women; indeed, the  
 the text agrees in stating that they occupied one side of the  
 nave from the first choir of the middle aisle. Tradition in a  
 some local churches, these galleries to women, but it  
 believe that tradition approaches the truth. We must state  
 that the gallery placed in the middle aisle was reserved  
 to the exterior to be entirely closed; that these aisles were  
 ornamented like that of the gallery of Montreuil, and that it  
 was reserved for women, indeed, it was reserved for women  
 galleries receiving appropriate instruction. But we must con-  
 sider that these are hypotheses and that we have no positive  
 proofs that can be furnished to support them.

For far from this is the monastery church of the 12th cen-  
 tury, Paray-le-Monial, possessing a choir that appears earlier  
 than the construction of the existing choir. The plan of this  
 choir (Fig. 19) is similar; it presents on its front three co-  
 arches with two aisles on each side. The choir each consist-  
 of four aisles, consisting of two outer aisles, and a central  
 aisle and a nave. The towers as at Amiens surround the two  
 outer aisles, and the central aisle is reserved for women.  
 of column. One sees that this choir is not placed on the  
 axis of the nave, as is the case in a triforium choir. In the choir  
 which is reserved for women, a hall covered by a vaulted roof  
 line on a triforium, as shown by the section (Fig. 20). This  
 hall does not form a triforium on the nave, it is closed and  
 reserved for women only in a triforium, which will be shown

as 2.6.12. above the floor.

The choir established on this plan have been adopted  
 since frequently in that part of France, i.e., in the vicinity  
 of the valley of Cluny; we see that these plans parallel during  
 the 12th century. The beautiful porch of the church of Notre-  
 Dame of Dijon was erected about 1230 on these principles, i.e.,  
 with three open arches on the facade, two detached interior  
 arches bearing the cross vaults, an upper hall and two exterior



so arranged. (Art. Tribune). But (in the 12 th century) the organs were not instruments of such great dimensions as to occupy these spaces; the chanters were in the choir or on the rood loft, but not on galleries erected near the entrance. Some authors have claimed that these galleries were reserved for women; but the women being in considerable number at the church would not have found there sufficient space; beside the texts agree in stating that they occupied one side of the nave from the first times of the middle ages. Tradition in some localities assigns these galleries to penitents, and we believe that tradition approaches the truth. We admit that an altar was usually placed in the halls open towards the nave, to the exterior to entirely closed; that these altars were orientated like that of the gallery of Montreale, and that it was reserved for special ceremonies, attended by penitents or believers receiving preparatory instruction. But we must confess that these are hypotheses, and that we have no positive proofs that can be furnished to support them.

Not far from Autun is the monastery church of the 12 th century, Paray-le-Monial, possessing a porch that appears earlier than the construction of the existing church. The plan of this porch (Fig. 19) is regular; it presents on its front three open arches with two arches at each side. Two piers each consist of four columns supporting the six cross vaults, that cover this ground story. Two towers as at Autun surmount the two first bays B, and quite imprudently rest on these two groups of columns.<sup>1</sup> One sees that this porch is not placed on the axis of the nave A, rebuilt on a different plan. In the second story it is surmounted by a hall covered by tunnel vaults resting on archivolts, as shown by the section (Fig. 20). This hall does not form a gallery on the nave, it is closed and opens at that side only by a window G, whose sill is placed at 6.6 ft. above the floor.

The porches established on this plan then have been adopted quite frequently in that part of France, i.e., in the vicinity of the abbey of Cluny; we see that these plans persist during the 13 th century. The beautiful porch of the church of Notre Dame of Dijon was erected about 1230 on these principles, i.e., with three open arches on the facade, two detached internal piers bearing 6 cross vaults, an upper hall and two unfinished





towers.

Note 1.p.283. M. Millet, charged with the restoration of the charming edifice, had to replace the columns, that were crushed; he placed in the middle of their group a column of granite, and thus he could preserve all its elegance to this northex. (See Archives des monuments historiques, published under the auspices of his excellency the minister of State.

The arrangement of this porch is remarkable. Built of good materials but with economy, it is perhaps the frankest expression of Burgundian architecture of the first half of the 13th century, so original and so boldly combined. The architects of this school only failed to be able to employ materials of absolute rigidity, like granite or even cast iron. Such was the boldness of those artists, that they dared with limestones, of great resistance it is true, but liable to crushing, to erect masonry of considerable weight on very slender piers; supplementing the insufficiency of the material by the wise combination of pressures and resistances.

The architect of the porch of Notre Dame of Dijon proposed a new problem. Having observed by the preceding examples the bad effect produced by buttresses separating the three arches of the facades of the porches, he suppressed these buttresses, and replaced them by a system of stone shores. The idea was ingenious, bold and without precedents. In that way no obstacle separated the three arches, the thrust of the intermediate transverse arches was abutted by the shores, and the weight of the internal angles of the two towers rested on twin piers as on a prop. Some defects in the execution caused these piers to bend toward the two side arches; and since this movement was produced during the construction, or resources failed, the two towers were not finished. They now rise only to the height of the nave. However that may be, and leaving aside the imperfections in detail that produced these movements, in their very idea was novel and fertile in results. Thus this porch is one of the most beautiful erected at that epoch, and much superior in conception to the Romanesque porches given in the preceding examples. So this architecture of the 13th century often shows itself at its origin full of resources, abounding in ideas, but sometimes imperfect in execution. Thus it is not by thoughtless imitation that one must work in our days, but by careful





research in ideas, that have produced its so rapid development, and in its theories fruitful in deductions. From the porch of Notre Dame of Dijon it would be easy, with some modifications of details and by employing materials more rigid than those used in the work, to build an edifice as graceful in appearance and as light, but irreproachable in regard to construction. For that it would suffice to lower the imposts of the lateral archivolts, and to erect the piers with high blocks of very resistant stone. To attain a result with imperfect means, but to allow to be divined the novel idea, the invention, is already much for those that observe and are willing to profit by their observation; for it is easier to perfect means of execution in architecture, than to discover a novel principle furnishing extensive results.

The upper hall of the porch of Notre Dame of Dijon forms a gallery to the nave.

The plan of this porch, half of which is given by Fig. 21, shows how the architect knew how to avoid the external buttresses at A. The two piers D form a double support that receives the front wall of the tower placed on the bay B opposite the buttress C, that abuts the vaults of the porch. At G are opened great windows with sills very high above the ground. In the height of the second story a gallery (Art. Galerie, Fig. 6) extends before the wall of the tower from E to F, and abuts against little turrets H corbelled out on the abutments C and containing the stairs, that permit ascending to the upper stories of those towers. The arrangement of the vaults of this porch is very wisely combined. We have indicated the system in Art. Construction. (See Figs 52 and 53). On the extrados of the archivolts L and J borne by isolated piers forming double supports, are turned the tunnel vaults M and N, that rise from a lintel-impost K. One will note that the architect has placed the wall of the tower, not vertically over these tunnel vaults but a little behind, as indicated by placing the buttress C, so as to make the piers A and P actual shores. I Indeed, these piers have ~~lost~~ left their vertical position on the face of the facade; the piers A and P are slightly inclined toward the lateral bays because of the thrust of the great arches L, D, and <sup>be-</sup> cause the springings of the arches J were not placed sufficiently low. As for the piers K, although loaded

of the sides of the tower, they have remained vertically, due to the intrinsic arrangement of the stones of the vaults.

The external and internal effect of this porch is most happy; the moldings and sculptures are in the best style.

It is also necessary to give among the great open porches, built in Germany during the 12th century, that of the church of Notre-Dame of Reims. That porch is opened by three arches in front and by two others at each side. As at Notre-Dame of Orléans, the vaults are of the same height. The vaults of the porch are of the same height as the vaults of the church. On the western facade of Notre-Dame of Reims, an arch is placed a porch opening in three arches, but only possessing three cross vaults, and only three arches. This porch is placed in front of the main porch, and is of the same height as the main porch. It was completed only in the 12th century.

The porch of the 7. Cathedral of the palace at Paris was also placed among the great open porches. Like the building to which it is attached, this porch is in two stories, and forms a sort of vast lobby open on one side of the palace.

Note 1. 2. 287. *Arch. Choiseul, 1794. 1. 2. 287. 1. 2. 287.*

The porch of the 7. Cathedral of the palace at Paris was also placed among the great open porches. Like the building to which it is attached, this porch is in two stories, and forms a sort of vast lobby open on one side of the palace.

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by the angles of the towers, they have remained vertical; due to the ingenious arrangement of the arches of the vaults.

The external and internal effect of this porch is most happy; the mouldings and sculptures are in the best style.

It is also necessary to cite among the great open porches, built in Burgundy during the 13 th century, that of the church Notre Dame of Beaune. That porch is opened by three arches in front and by two others at each side. As at Notre Dame of Dijon, two isolated columns support the 6 vaults. The porch of Notre Dame of Beaune has never been finished in its upper part, and was not surmounted by towers. On the western facade of Notre Dame of Semur-en-Auxois is placed a porch opening in three arches, but only possessing three cross vaults, and consequently being without isolated columns. This porch is closed at the sides and dates from the beginning of the 14 th century, and was completed only in the 15 th century.

The porch of the S. Chapelle of the palace at Paris must be classed among the great open porches. Like the building to which it is attached, this porch is in two stories, and forms a sort of vast loggia open on one court of the palace.<sup>1</sup>

Note 1.p.287. Arts Chapelle, Figs. 1, 2; Clocher, Figs. 2,3.

#### PORCHES OUVERT SOUS CLOCHERS. Open Porches under Towers.

It would be very natural, when one undertook to erect a tower on the principal facade of a church, to place a porch in the ground story. In the provinces of the West, Centre and South, from the 11 th century, men had the habit of building great square towers before the western entrances of churches; the lower portion of these towers served as a porch.<sup>2</sup> In Art. Clocher (Figs. 41 and 42), we gave the great porch erected on the western facade of the abbey church of S. Benoit-sur-Loire. This porch dates from the 11 th century and is composed of a quincunx of thick piers supporting Roman cross vaults.<sup>3</sup> It occupies a considerable area and is surmounted by a great hall, like the ground story, open on three of these sides and also presenting a quincunx of piers. The tower must rise on the four central piers. In the same Article (Fig. 7) is also seen the plan of the porch of the cathedral of Limoges, which dates from the 11 th century, originally open at the sides and supporting a tower. The lower part of the tower of the church of Lesterps presents a porch, whose arrangement recalls the porch

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Notes 2.0.287. In Art. 10 October see the top of the left page

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*cf. Gering et al. in: Journal of the American Statistical Association* 86 (1991), 9, 2, 218

Architectur du 15 au 18 siècle, in Göttingen.

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1. The first part of the document is a letter from the President of the United States to the Secretary of the Navy, dated 1890. The letter discusses the appointment of a new Secretary of the Navy and the importance of the position.

It is noted that the above information was obtained from the records of the Bureau of the Census.

and narrow, closed at the sides, it takes the place of one of

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Attention dates back to the second half of the 19th century.

to give the plan (Fig. 2) and the longitudinal section (Fig. 3).

Note 4.9.297. This office was much changed a few years since.

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-After this situation the evidence was not sufficient to establish the facts.

U.S. GOVERNMENT PRINTING OFFICE: 1967

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Notes: 1. The above information is for informational purposes only and is not intended to be used for any other purpose.

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of S. Benoit-sur-Loire (Art. Clocher, Figs. 43, 44), but which dates from the 12 th century.

Note 2.p.287. In Art. Clocher see the map of the different schools of towers (Fig. 61), in which it is proved that two prototypes of these towers at Périgueux and at Brantôme, send branches even to Cahors, Toulouse, Puy, Roches, S. Benoit-sur-Loire, etc.

Note 3.p.287. See the entirety and details of this porch in *Architecture du 5e au 18e siècle*, by Gailhabaud.

These programmes are not found in Ile-de-France, Normandy, Burgundy and Champagne. The porches under the towers of Ile-de-France are generally closed at the sides, like the western porch of the abbey church of S. Germain-des-Prés, and like that of the church of Greteil near Paris.<sup>4</sup> The porch of Greteil was perfectly preserved a short time since; its appearance was monumental. It opened in an arch in front and had a tunnel vault. It is only a shelter before the entrance of the church; long and narrow, closed at the sides, it takes the place of one of those lobbies erected in our times behind the doors. Its construction dates back to the second half of the 11 th century. We give its plan (Fig. 22) and the longitudinal section. (F.23).

Note 4.p.287. This edifice was much changed a few years since.

The single arches of these porches opening externally were closed by hangings, if we can believe old paintings and reliefs preceding the 13 th century; one still sees little projecting corbels or the holes, that served for placing the wooden rod from which was suspended this sort of cloth portieres.

Beneath the tower of church S. Savin near Poitiers exists a porch of the same epoch, entirely covered internally by remarkable paintings. This porch is simpler in architecture than that of Greteil, further presents an analogous arrangement.<sup>1</sup> The western tower of the collegiate church of Poissy rises over a porch of an early date (beginning of 11 th century); it likewise opens on the public way by a single arch and has a round tunnel vault.<sup>2</sup>

Note 1.p.289. See *Monog. de l'église de S. Savin*, pub. by the care of the minister of public instruction.

Note 2.p.289. It is also necessary to cite here one of those porches preserved under the western tower of the church S. Severin of Bordeaux, and that dates from the beginning of the 12 th century.

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If one penetrates into the provinces of the Centre to Tulle and Chatre, he sees porches under towers with three open arches, one on the front and two at the sides. These porches date from the end of the 12 th century and participate in the arrangements adopted for porches under the towers of Limousin and Perigord.

Among the most remarkable porches erected under the influence of these two schools, but however do not possess the internal piers, that we see in the porches of Limoges, Lesterps and S. Benoit-sur-loire, it is necessary to cite that of the abbey church of Moissac.

The construction of this porch is of great interest for the history of the art. It dates from two epochs, both very near each other, of the beginning and the middle of the 12 th century.

Fig. 24 gives the plan of its ground story. Primitively the porch opened at the south side at C by a wide pointed arch. At the west side at D and on the north side at E, it opened on the dependances of the abbey, on the cloisters and was closed by doors.

A third doorway F with a central mullion gave access to the nave of the church. Shortly after its construction, i.e., about 1150, was added to the great porch supporting the great tower a second porch or external shelter G richly decorated by reliefs and by sculptures in a very grand style (Art. Statuaire). The piers H and the buttresses I were erected. These attached structures served to support a crenelated gallery that defended the entrance of the church. Fig. 25 gives the plan of the hall built over the porch, and on the piers of which should rise a tower never finished. The different tints of the plan indicated the first construction and the additions made at the middle of the 12 th century to receive the battlements in two stories on the external porch at K, and a single defensive gallery at the sides L and M. It was a very bold experiment at the beginning of the 12 th century to cover a hall 32.8 ft. wide by a single vault not a dome, and the architect of the porch of Moissac solved this problem as a skilful constructor. The vault of the ground story is a cross vault, i. e., is composed of side arches with two wide diagonal arches of rectangular section, on which rest the four triangles of

the first half of the 19th century. The style of the house and the garden is of the 18th century. The house is a two-story building with a central hall and two wings. The garden is a large, open space with a central path and several smaller paths. The house is built of brick and has a red-tiled roof. The garden is planted with various flowers and trees. The house is a fine example of 18th-century architecture. The garden is a beautiful and well-maintained space. The house and garden are a great place to visit. The house is a fine example of 18th-century architecture. The garden is a beautiful and well-maintained space. The house and garden are a great place to visit.



the vault built of roughed rubble. The vault of the upper hall is composed of 12 arches radiating from a central eye reserved for the passage of the bells. Our section (Fig. 26), made on the line A B of the plan of the ground story, explains this structure. The detail N indicates the jointing of the stones forming the crown of the vault of the ground story (for the diagonal arches are built of stones of small dimensions). As for the arches of the vault of the second story, that may already pass well for a vault in Gothic style, the diagonals are round and the 8 others springing from the intermediate piers are circular arcs. One will note that these 8 intermediate arches are set obliquely on the capitals of the piers, while the abacuses of those capitals have their faces parallel to the sides of the square. Yet already the abacuses of the diagonal arches are set according to the direction of those arches. (See plan, Fig. 25). These two low and high halls have a monumental effect that produces a strong impression. Although the construction is rude, it is well executed and has not moved. The additions made at the middle of the 12 th century, however interesting they may be, have altered the grand appearance of the exterior of this porch, and have darkened this beautiful upper hall, whose purpose we do not know, and that opens so widely to the exterior. The nave of the church having been rebuilt at the beginning of the 15 th century on a plan analogous to that of the cathedral of Alby, it is difficult today to know how this upper hall was arranged with the primitive nave. Yet the three arches P were bricked up at the rebuilding in the 15 th century, and necessarily opened on the old nave, placing the high hall in direct communication with that without the interposition of glass. But we have already seen by some examples of porches surmounted by halls, given in this Article, that the naves were rarely closed by glass, particularly in the provinces of the Centre and the South, before the end of the 12 th century.

The porches beneath towers are rare from the beginning of the 13 th century in French architecture. Yet we will cite that of the church of Larchant.<sup>1</sup> Normandy presents some dating from the 14 th and 15 th centuries; we shall mention as one of the most remarkable that of the tower of the church S. Pierre at Caen.<sup>2</sup>

[illegible]



Note 1.p.293. See *Monuments de Seine-et-Marne*, by MM. Auzou-  
vre and Fichot.

Note 2.p.293. See Pugin, *Specimens of the architectural art  
of Normandy*.

On the banks of the Rhine and in the adjacent provinces, that arrangement continues quite late. The porch of the cathedral of Fribourg opened beneath the western tower is very beautiful. Internally it is ornamented by good figures representing the liberal arts of natural size, Christ, the wise virgins, the foolish virgins, the sacrifice by Abraham, S. John Baptist, S. Mary the Egyptian, etc. This porch opens only by an arch in front, the sides being closed and decorated by the statue, and <sup>of</sup> which we have just mentioned the principal ones.

Speaking of porches beneath towers, one cannot pass in silence the porches so well arranged under the projected towers of the facade of S. Ouen at Rouen.

Those towers must be of colossal dimensions, but were only built to about a height of 65.6 ft. above the ground. When there was a question of completing the facade of the church of S. Ouen in 1840, they dared not continue the work begun on such considerable dimensions; thus the shafts of the towers were demolished, and so was lost one of the most original and most ingenious arrangements among all those conceived by the middle ages in its decline, for those towers dated from the 15<sup>th</sup> century.

They rose on two porches set diagonally and formed skew entrances to the two side aisles. The plan of these two porches is engraved in the work of Pugin on the monuments of Normandy, to which we refer our readers.<sup>3</sup> The oblique position of the church of S. Ouen permitted opening them externally by two sheltered openings directed to the centre of a large yard formed by the projection of the towers. Thus were avoided air currents in the church, the outer doors of the porch and those opening into the side aisles not being placed opposite each other. The multitude of believers, leaving by the two side doors and the central portal, naturally found itself gathered on the area of the yard without any resulting inconvenience. There is reason for surprise, that this arrangement so well designed, and with such happy effect, was not followed in the construction of some of our modern churches, the more that it





can accommodate itself to all architectural styles.

Note 3.p.293. Art. Architecture Religieuse, Fig. 82.

#### PORCHES D'EGLISES ANNEXES. Porches attached to Churches.

Dating from the end of the 12 th century porches attached to the principal or lateral facades of churches became very common. Why? Before that epoch the most important churches were those dependant on monastic establishments. As we have seen, these churches possessed very vast porches if they belonged to the order of Cluny, in the form of porticos if they were of the order of Citeaux, more or less extensive if they depended on neither of those orders, but formed a part of the primitive or completed plan of the religious edifices. When these porches were annexed, so to speak, they completed an entirety of structures conceived after one dominant idea. The parish churches before 1150 were small, poor, and copied more or less the great monastic churches. Before that epoch the cathedrals themselves were small, and they likewise arose under the predominant influence of edifices due to the religious orders. But when about 1160 the bishops knew how to collect those immense resources, that allowed them to erect churches rivaling those of the religious orders, and even surpassing them in richness and extent, they adopted plans differing in many points from those adopted by the monks. No more chapels, porches or narthex. The cathedrals generally took as a type a basilican plan with central nave and side aisles; doorways widely opened appeared on the facade, without a vestibule. It seemed that the monument of the city, the cathedral, was especially desired to be accessible to the multitude, that all was avoided that might form an obstacle to its admission. It was a covered forum, to which all were invited without preparation or initiations. But soon, as explained elsewhere,<sup>1</sup> the hope that the bishops had conceived of becoming the political and religious chiefs of the city vanished before the new attitude assumed by the royal power. The cathedrals must restrict themselves to their purely religious functions; chapels were built and enclosures around the choirs; their long naves were cut to install transepts in them; and finally porches were added before the entrances. Yet if the primary idea that caused their erection must leave a perpetual trace, those porches were chiefly placed before the secondary or side entrances; a

and the principal facade, the portals, as in the primitive associations of these monuments, seemed their wide doorway on a very simple porch or external vestibule. It even has a certain character, whose plan in the 12th century has been conceived with a front porch, for example like Chartres, suggested this porch at the beginning of the 13th century, to open the doorway directly on the public place. If some cathedrals, which is further rare, possessed porches before their external stairs, the doorway has been of this type, but as porches have from the end of the 12th century or even the beginning of the 13th; for we cannot regard as porches the fine solays preceding the western doorways of the cathedrals of the 12th and 13th centuries. These are portals, i.e., portals of doorways.

Note 1. p. 384. See also *Antiquités*. Vol. II. p. 280 et seq. (the same observations are in the *Antiquités*. Vol. II. p. 280 et seq. Note 1. p. 385. It is necessary to note here (Ant. Antiquités, Vol. II. p. 280 et seq.) that the porch of the cathedral of Amiens was not erected according to the original design. But even on admission the first primitive plan, no more than of the cathedral of Amiens we cannot see in those pronounced spaces of the doorways what forms a porch, i.e., an open or closed vestibule. About the middle of the 13th century on the contrary, we see arise well characterized porches before the secondary doorways of cathedrals. At that epoch about 1250 were built the lateral porches of the cathedral of Chartres, Bourges, Orléans, Reims, Amiens, Sens and Bayeux, and that these porches were often built before doorways not intended to be sheltered. This example was soon followed in the monastic churches. During the 13th century it is especially the case of the cathedral of Amiens, the cathedrals of Bourges and Sens, and the cathedrals of Reims and Amiens, after the 13th century their exterior as well as their interior porches.

At the end of the 12th and beginning of the 13th centuries, two porches, one on the north and the other on the south side, were placed before the secondary doorways of the Romanesque cathedral of Bayeux-Vieux, and these two porches are almost equal by height, but these are unusual, nowise harmonizing with the edifices to which they are added, while it is necessary to see in the lateral porches of the cathedral of Chartres concen-



and the principal facades, the portals, as in the primitive conceptions of these monuments, opened their wide doorways on a yard without porches or external vestibules. We even see that certain cathedrals, whose plan in the 12<sup>th</sup> century had been conceived with a front porch, for example like Chartres, suppressed this porch at the beginning of the 13<sup>th</sup> century, to open the doorways directly on the public place. If some cathedrals, which is further rare, possessed porches before their principal facade, for example like that of Noyon, those porches date from the end of the 13<sup>th</sup> century or even the beginning of the 14<sup>th</sup>; for we cannot regard as porches the wide splays preceding the western doorways of the cathedrals of Amiens and even of Laon.<sup>1</sup> Those are portals, i.e., sheltered doorways.

Note 1.p.294. See *Art et Cathédrale*. Vol. II. p. 280 et seq. Also see *Entretiens sur l'architecture*. Vol. I.p.263 et seq.

Note 1.p.295. It is necessary to note here (*Art. Cathédrale*, Fig. 19), that the portal of the cathedral of Amiens was not erected according to its original design. But even on admitting that primitive plan, no more than at the cathedral of Laon, we cannot see in those pronounced splays of the doorways what forms a porch, i.e., an open or closed vestibule.

About the middle of the 13<sup>th</sup> century on the contrary, we see arise well characterized porches before the secondary doorways of cathedrals. At that epoch about 1245 were built the lateral porches of the cathedral of Chartres, Bourges, Chalon-sur-Marne, Mans and Bayeux, and that these porches were often built before doorways not intended to be sheltered. This example was soon followed in the monastic churches. During the 14<sup>th</sup> and 15<sup>th</sup> centuries were erected a number of porches at the sides of those edifices as for parish churches, after the 13<sup>th</sup> century their principal as well as side doorways frequently open beneath porches.

At the end of the 12<sup>th</sup> and beginning of the 13<sup>th</sup> centuries, two porches, one on the north and the other on the south side, were placed before the secondary doorways of the Romanesque cathedral of Puy-en-Velay, and those two porches are surmounted by halls, but these are unusual, nowise harmonizing with the edifice to which they are added, while it is necessary to see in the lateral porches of the cathedral of Chartres concep-





conceptions harmonized with the monument already built. The north and south porches placed before the transept doorways of the cathedral of Chartres justly pass for masterpieces. They were evidently composed by artists of the first order, and present one of the most beautiful specimens of French architecture of the middle of the 13<sup>th</sup> century. Their plan, construction and ornamentation, the statuary covering them, are subjects of inexhaustible study, and their entirety presents that complete harmony so rare in architectural works. That on the north is richer in details, more complete in the entirety of the sculpture, perhaps more original in composition, and would produce more effect if it were erected on a grand flight of steps, like that on the south, and more exposed all day to the rays of the sun. Originally, these two porches were painted and gilded; their appearance they must have been marvellous. When one examines them in their entirety and their details, these clear compositions, profitably studied and of irreproachable execution, one can ask himself if since then we have not forgotten instead of learning; if we are the descendants of those masters, whose fertile imaginations were still subject to rules as rigorous as wise; and if there be not more art and taste in one of these masterpieces, than in most of the pale and cold monuments erected in our days.

The sum of the intelligence, science and knowledge of effects and practical experience expended in these two porches of Notre Dame of Chartres would suffice to establish the glory of an entire generation of artists; then the arts of architecture and of sculpture knew how to form an intimate alliance, and remained closely combined.

We do not believe it necessary to give here illustrations of those porches published in so many works,<sup>1</sup> lithographed and photographed many times. We shall pass to the study of examples in less remarkable, but less known. The church of S. Nicaise of Rheims was built by the architect Libergier, who died in 1263;<sup>2</sup> this was one of the most beautiful religious monuments of Champagne. Wise in construction, the church S. Nicaise shows what the architecture of Champagne became at the middle of the 13<sup>th</sup> century, a mature art. On the facade of that church opened three portals; the central one on the axis of the great nave, and the two others on the axes of the

[illegible]



side aisles. We shall return immediately to these secondary doorways. The central doorway was preceded by a porch of small depth, erected between the two buttresses abutting the archivolts of the nave, and receiving the weight of the angles of the two towers. Fig. 27 shows us at A the outline of the plan of that porch with the scale in ft. From the axis of one buttress to that of the other counts 40 ft. The buttress had 8 ft. in front; one also counted 8 ft. for the opening of the arches B, and 16 ft. for the opening of the central arch; for the depth of the porch 4 ft., it being only a shelter. Thus the 4 isolated and engaged columns a, b, c, d, divided the distance a d into three equal parts, and these 4 columns bore three archivolts surmounted by gables. (See elevation G). Each archivolt circumscribed an equilateral triangle, and the two gables formed two sides of an equilateral triangle. If the central arch were entirely open, those of the two sides were half occupied by the thickness of the buttress, as shown by our plan at E and E'. As for the splay of the portal, it was arranged so that at K existed woodwork forming a framework or double doorway. At C is traced the section of the porch on l m. Fig. 28 gives the perspective view of the central porch of S. Nicaise of Rheims. Simple as is its plan, this composition had great richness in elevation, but without the details injuring in anything the entirety of the lines. At first the architect had the novel idea of giving to his porches the appearance of one of those decorations, that are arranged before the facades of churches on days of great ceremonies. Without opposing the principal structure of the architecture, these arches surmounted by gables form a sort of ornamental substructure occupying the entire width of the church, and pierced by openings at the doorways. This was like a wide scaffold all hung with tapestries; for one will note that the surfaces of this substructure are ornamented by fine fleur-de-lis in relief, that give the appearance of a fabric. Behind this light architecture, that seems erected for a festival, are seen the doors richly ornamented by reliefs. This central space, of which we give a perspective view (Fig. 28), bore on its mullion the statue of S. Nicaise; in its tympanum was Christ seated on the world at day of judgment, with the Virgin and S. John beside him with adoring angels; below at one side were the elect; on the other





the damned, some of which were drawn into hell in a wagon. In the spandrels, two angels sounded trumpets. The twelve apostles were not placed as statues in niches, but as groups of personages in the two recesses made beside the jambs of the doorway. One sees how, with an arrangement extremely simple in plan, the architect Libergier knew how to produce a very ornamental entirety, easy to follow at a glance.<sup>1</sup> The two porches opening on the axes of the side aisles were each composed of a single arch pierced between the two great buttresses of the towers. This arch was surmounted by a gable, like those of the central porch, and had an opening of 12.8 ft. But as these lateral porches were those generally used (the central portal being opened only for processions or to allow the exit of the multitude), their porches had a greater depth (6 ft.), and inside were placed permanent frames, very ingeniously arranged. The plan (Fig. 29) shows the arrangement of these frames at A, and the entrance of the stairs to the towers, an entrance also found outside the church, though protected by the external doors. The spaces A and B were covered by pointed tunnel vaults, like the archivolts, and the tympanums of the doors were decorated by reliefs in the quatrefoils and lobes, like that of the central doorway. The surfaces D were likewise covered by scattered fleurs-de-lis in low relief. Libergier seems to have been at first of the idea of so treating the porches, <sup>as</sup> oddities, recalling the temporary works erected before the portals of churches on the occasion of certain solemnities. That idea was developed later with more or less good fortune, but without having surpassed this first attempt, it seems to us. Yet at Troyes in the same province there still exist two porches of a very remarkable arrangement before the doorways of the transepts of the church of S. Urbain.<sup>1</sup> These porches are actual canopies supported by flying buttresses transferring the thrust and the load of their vaults, to the external isolated buttresses. The plan of one of these porches, entirely alike each other (Fig. 30), indicates this arrangement. The space A, B, C, D, is vaulted. These two vaults rest on the wall of the transept and on three piers B, E, C. Three flying buttresses G, H, I, transfer the external thrust of these vaults to the three buttresses J, K, L. The lightness of this construction is surprising, built in lias from Tonnerre





of excellent quality. These two vaults actually have the appearance of a suspended canopy, for their projection scarcely allows to be seen the slender columns that receive them. As for the buttresses I, K, L, in spite of their relative importance, they are so singular (the two buttresses I and L being opposite those at O and M of the church), that they do not seem to belong to the porch, and the eye does not stop there. At P, we have sketched at the scale of 1 : 20 one of the angle columns B, C, and at R is the detail of the pier S with its niche T at the same scale. A section made on X V (Fig. 31) takes account of this singular construction, whose elevation can give only a very incomplete idea. In perspective the buttresses and flying buttresses do not project as in the elevation, they separate from the porch, leaving it independent. For example, the flying buttress A, has an elongated plan and abutting the first buttress of the choir, does not participate in the construction of the porch;<sup>1</sup> the buttresses marked I and L in the plan seem to be attached to the church and not to the porch. There is in this composition an entirety of effect, that an elevation cannot render, and which with difficulty is expressed in a perspective view. But what must attract the attention of architects in the porches of S. Urbain is the grandeur of the system. In spite of their excessive lightness and the slenderness of the different architectural members reduced to their weakest dimensions, these porches are grand in scale, and do not have the leanness with which one reproaches many edifices erected at the end of the 13<sup>th</sup> and beginning of the 14<sup>th</sup> centuries. The elevation made on the line a b of the plan (Fig. 32) fully shows how this composition is broad and clear, and how the details are subject to the masses. On the two lateral archivolts are erected the gables, as on the front; and the roofs of slate follow the slopes of these gables, so that the water runs off by channels placed on the flying buttresses and by gargoyles set before the buttresses (see section). Behind these roofs form a hip with a gutter, so as to relieve the great windows of the transepts. The gables indicate the form of the roofs, which is rational. Above the two doorways opened two windows under the porch, as shown by Fig. 32, windows with tracery skilfully combined with the open gables, that surmount these two doorways.





Note 1.p.296. See *monographie de la cathedrale de Chartres*, by M. Lassus. The work of M. Gailhabaud, *l'architecture du Xe au XVe siecle. Les exemples de decoration* of M. Goussier.

Note 2.p.296. The tomb of the architect Liberger is now placed in the cathedral of Rheims; before the demolition of the church of S. Nicolse, it was placed in that monument.

Note 1.p.298. The church of S. Nicolse was demolished since the end of the last (18 th) century. By ordering that demolition, the people of Rheims deprived their city of France of one of the most beautiful monuments of the 13 th century. Happily the documents on that edifice are not too few; there are plans and several engravings, among others that of the facade, which is a real masterpiece, and which is due to an engraver of Rheims named De-Son. That rare plate dates from 1825.

Note 1.p.300. We have had very frequent occasion to speak of this pretty church, which presents the most complete and most extraordinary development of the architecture of Champagne in the 13 th century. (Arts. Architecture Religieuse? Construction, Figs. 102 to 106; Fenetre, Pilier).

Note 1.p.301. This is the flying buttress marked Y on the plan.

The construction of the porches of S. Urbain of Troyes is conceived like that of all other parts of that pretty edifice; i.e., it consists of great blocks of stone from Tonnerre forming an actual front for the archivolts, gables, balustrades, openings and turrets, with low courses for the buttresses. As for the filling of the vaults, it is made of small materials.<sup>1</sup> These porches, like the entire construction of S. Urbain, erected at a single spurt and dating from the last years of the 13 th century, is one of the boldest and wisest of the middle ages. The 14 th century did not attain this lightness, and particularly this breadth of composition in the works of the same kind, that it had to erect. Thus the southern porch of the church of S. Ouen of Rouen, built about the end of the 14 th century, is far from having this ample and light appearance; it is heavier and is surcharged with details, that injure the entirety. The western porch of S. Maclou at Rouen is certainly one of the richest erected in the 15 th century, but it takes all importance from a facade, and does not seem to have that special purpose so well indicated at S. Urbain of Troyes.<sup>2</sup>





The arrangement of the porch of S. Maclou still has this of interest, that it lends itself to the form of the enclosing streets, and that its lateral arches form in plan two sides making very oblique angles with the central arch, to give the multitude of believers more easy access.

Note 1.p.304. For the system of construction adopted at S. Urbain of Troyes, see *Arts Construction*, Plés. 103 to 106.

Note 2.p.304. See the beautiful photographs of that porch made by Bisson Freres.

The church S. Germain l'Auxerrois at Paris possesses a porch from the beginning of the 15 th century that is perfectly conceived. It opens in front by three principal arches that comprise the width of the nave, and by two lower and narrower arches before the side aisles; a similar arch at each side gives lateral exits. The vaults over the two end bays are surmounted by two chambers covered by steep roofs and lighted by small windows opened in the tympanums compensating for the difference in heights of the great and small arches. A balustrade or crowns this structure covered by a terrace below the rose window in the central part.

The sculpture and details of this porch, although often retouched and recently rubbed, lack character and are soft and poor. The porch of S. Germain l'Auxerrois is only good to study from the point of view of the entirety and of its happy proportions. The central doorway that opens into the nave partly dates from the 13 th century, and is the sole fragment of that epoch found in the entire edifice, rebuilt during the 14 th, 15 th and 16 th centuries. The system adopted in the construction of this porch appears to us to properly fulfil the conditions imposed by the needs of a great parish church, for which we present here (Fig. 33) its general view.

One will note that the end arches being lower than the middle ones, the believers gathered under that external vestibule, also deep, are perfectly sheltered from wind and rain, although circulation is easy. Not as much can be said of porticos, peristyles or porches, claimed to be classical, established before churches built within two centuries. The peristyles of S. Sulpice, the Madeleine, S. Vincent de Paul, Notre Dame de Lorette, perhaps present a more majestic decoration, but they are an insufficient obstacle to the wind, rain and sun.

On the northern fringe of the old town of Alby, one may still find the remains of a small castle of the 12th century. The castle was built on a hill and was surrounded by a moat. One of the most beautiful corners of the castle is certainly that sheltering the main gateway of the castle. This corner is an almost empty square and on its sides are the remains of the castle. It rises on the top of a small hill of stones, formerly protected at its lower part by a fortified wall, of which very imperfect remains are seen. The plan of the corner of the castle of Alby with the line of stones preceding it and the main entrance. The stones A and B open on a vast plain surrounded by a low wall. The stones A and B are marked by a low wall. The stones A and B are marked by a low wall. The stones A and B are marked by a low wall.

Note 1.0.306. 177. 178. 179. 180.

The corner of the castle of Alby is one of the most beautiful of the old town of Alby. It is situated on a hill and is surrounded by a moat. One of the most beautiful corners of the castle is certainly that sheltering the main gateway of the castle. This corner is an almost empty square and on its sides are the remains of the castle. It rises on the top of a small hill of stones, formerly protected at its lower part by a fortified wall, of which very imperfect remains are seen. The plan of the corner of the castle of Alby with the line of stones preceding it and the main entrance. The stones A and B open on a vast plain surrounded by a low wall. The stones A and B are marked by a low wall. The stones A and B are marked by a low wall.

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On the southern facade of the collegiate church of Poissy, one notes still the remains of a pretty church of the 16<sup>th</sup> century; but this appendage was rebuilt in 1821 and has lost its character. One of the most beautiful porches erected at that epoch is certainly that sheltering the south doorway of the cathedral of Alby.<sup>1</sup> This porch is an actual canopy supported on piers before the entrance of the church. It rises at the top of a grand flight of steps, formerly protected at its lower part by a fortified work, of which very imperfect remains are seen. We give (Fig. 34) the plan of the porch of the cathedral of Alby with the flight of steps preceding it and the front defense. The arches A and B open on a vast platform surrounded by crenelated walls. Fig. 35 presents a perspective view of this porch taken from the side of the steps.

Note 1.p.306. Art. Cathédrale, Pl. 50.

The porch of the cathedral of Alby is one of the compositions of the last schools of the middle ages, and produces a marvellous effect, built of white stone, is detached on the tone of the brick of the church and on the sky in the most picturesque manner; its position is so well drawn at the top of the long flight of steps, in fact being the most imposing entrance that can be imagined. Formerly a long and high glazed window opened over the gate and below the vault of the porch, and gave great light within the church, otherwise very dark.<sup>2</sup>

Note 2.p.306. M. Doly, diocesan architect of Alby, was recently charged with restoring this porch, and has acquitted himself of this difficult task with remarkable talent.

In this Article we have been able to give all the examples of church porches that merit being mentioned; we have restricted ourselves to producing those presenting a really frank character, that clearly emphasize their purpose, and whose composition offers the originality due to artists of talent. The churches of France are certainly those presenting the most varied examples, those best understood and the grandest of the porches of the middle ages. In Germany they are rare; habitually low and small in England. But certainly nowhere in Europe, neither in Italy, Spain, Germany nor England, does one see porches that can be compared even afar to those of Chartres, S. Urbain, S. Maclou, cathedral of Alby, S. Quen of Rouen, and S. Germain l'Auxerrois.

combined with the principal elements of stone of palaces and castles. On the public way it was impossible to place corners before the houses. These sometimes possessed continuous corners or corbelled projections forming a shelter, or again a small covered way, (fig. 36). The houses were by no means all of the same height, and the streets were generally the chief of the middle ages, whose streets were generally narrow. Sometimes in the corner a pavilion resting its angle on a single pier formed a little porch before the entrance to the exit from an alley, as shown in fig. 36. At the angle of a building or a corner was also left in certain cases, or under a house, a covered area open on the public street; and these shelters were raised looking over the houses, and were of wood near markets; they were built on a small scale, and were called *overhangs* today.

fig. 36. In 17th. century, fig. 36, was the plan and elevation of the mansion of the Earl of Devon, and the house forming a porch for the ground story, at the corner of the passage leading to the kitchen. Also see Art. *Porches*.

fig. 37. 17th. century.

Let the vignettes of the manuscripts of the 15th century frequently present other important features before mentioned on the public street; and these porches are always represented as being relatively very ornamental. A beautiful manuscript of a book soon belonging to the library of Troyes (No. 178) gives the porch of a mansion, whose plan and arrangement are given here (fig. 37). The porch is placed at the angle of the building and forms a vestibule inside. The perspective furnished by the manuscript is represented by our fig. 38. This porch is very small in scale, and is only a shelter able to contain four persons. This suited the entrance of a habitation. Above the corbel supporting the projecting of the front scale is placed one of those statues of the Holy Virgin, so frequent in the crosses of the chief of the middle ages and at the corners of streets.

But the form of porches most commonly adopted before civil

architecture, was as follows, (fig. 38), which was the



## PORCHES ANNEXES A DES CONSTRUCTIONS CIVILES.

## Porches attached to Secular Structures.

Atricles Escalier and Perron give some examples of porches combined with the principal flights of steps of palaces and castles. On the public way it was impossible to place porches before the houses. These sometimes possessed continuous porticos or corbelled projections forming a shelter, or again actual permanent hoods. (Arts. Auvent, Maison). Porches properly so called would have obstructed passage, particularly in the cities of the middle ages, whose streets were generally narrow. Sometimes in the courts a pavilion resting its angle on a single pier formed a little porch before the entrance or the exit from an alley, as shown in Fig. 36.<sup>3</sup> At the angle of a public place or a crossing was also left in certain cases, or under a house, a covered area open on the public street; but these shelters were rather loggias than porches, and were placed near markets; they were rooms on a small scale, what are called exchanges today.<sup>1</sup>

Note 3.p.306. In Art. maison, Figs. 36, 37, see the plan and elevation of the mansion de la Tremoille, the turret forming a porch for the ground story, at the entrance of the passage leading to the garden. Also see Art. Touraille.

Note 1.p.309. Art. Loge.

Yet the vignettes of the manuscripts of the 15 th century frequently present quite important porches before mansions on the public street; and these porches are always represented as being relatively very ornamental. A beautiful manuscript of that epoch belonging to the library of Troyes (No. 178) gives the porch of a mansion, whose plan and arrangement are given here (Fig. 37). The porch A is placed at the angle of the building and forms a vestibule inside. The perspective furnished by the manuscript is represented by our Fig. 38. This porch is very small in scale, and is only a shelter able to contain four persons. This suited the entrance of a habitation. Above the corbel supporting the springing of the front gable is placed one of those statues of the Holy Virgin, so frequent at the crossings of the cities of the middle ages and at the corners of streets.

But the form of porches most commonly adopted before civil structures, such as hospitals, leper hospitals, houses for a





assemblies of citizens, rural habitations, is that illustrated by our Fig. 39. These additions consist of side walls with stone pillars on which wooden plates bear a ceiled carpentry structure, whose span was only retained by raised collar beams. The lightness of this sort of structure would not have permitted them to come down to us, and if there still remain some of them, this is because they have been enclosed in the midst of more recent structures. In the countries of the North, Sweden and even England, men continued very late to build porches according to this system; thus some of them are still standing, the more because the carpentry employed in these countries is much heavier than that used in France. It was also customary in Flanders to erect wooden porches before drawbridges of castles and manor houses, so as to place under cover the persons waiting to be allowed to enter; but with us this sort of structures always had the appearance of a little castle, or at least that of a defended post.

We have given only a small number of the examples supplied by the porches of the middle ages compared with their abundance, for these additions must be erected on programmes not uniform, and it was natural to vary their appearance, as well as their construction and general arrangement. There are many important porches that we have mentioned, and that require an entirely special study; such are the porches of Notre Dame of Chartres, the cathedral of Bourges, S. Maclou of Rouen, the church of Louviers, and among the much older porches, those of S. Front of Perigueux, the churches of Auvergne, Notre Dame des Doms at Avignon, etc. As for additions before doorways, that because of their small projection, or rather because of their intimate connection with the edifice to which they belong, for us cannot be regarded as porches, we class them as portals.

#### PORT. Port. Harbor.

There remain to us but few traces of the maritime ports established during the middle ages. The arrangement of the ports changed continually because of the developments of commerce, and one must not be surprised to no longer find ports dating several centuries since, and entirely preserved. Yet from the 11th century the shores of France possessed very important ports. Without mentioning the ports of the Mediterranean, which

[illegible]

The use of piers was found impractical, as it is in our days, a  
desideratum to construct piers in groups or to maintain the piers  
of the channel and prevent it from filling with sand. The sub-  
structures of the western pier at Diego are very ancient and  
existed before the 16th century, since at least good buildings  
exist and only recently. The small pier on the east of the



like that of Marseilles dated from a very distant epoch, one also counts from that epoch those of Frejus, Agde, Narbonne and Antibes, which could contain a great number of ships. Everything leads one to believe that the ancient port of Marseilles, still utilized during the middle ages, occupied the place of the old port of that city. On the coasts of the Atlantic, there were in the 12 th century ports at Bordeaux, Rochelle, the mouth of the Loire, Brest, and in the channel at S. Malo, Granville, Cherbourg, Caen, Dieppe, Boulogne and Wissant.

These ports were mostly enlarged and protected by important works during the 13 th and 14 th centuries. One still sees at the entrance of the ports of Marseilles one of the towers, that defended the inlet of the port, and that dates from the 14 th century. At the entrance of the port of Rochelle also exists a beautiful tower, whose substructure is very ancient, and whose upper part dates from the 14 th century, and which defends the channel. It is connected with a work built on the other side of the inlet closed by a sort of portcullis. M. Lisch, architect, has discovered very interesting traces of these defenses, and should make them the subject of a work to be published. The same city possesses a beautiful lighthouse dating from the 14 th and 15 th centuries, which is still entire, although no longer employed for that purpose. At Aiguines-Morts, king Louis IX first established at the entrance of the port, that served him as a base of operations for his expeditions beyond the sea, a very important tower crowned by a fire, and that is known today by the name of the tower of Constance.

Ports were closed during the middle ages by chains, and sometimes by portcullises suspended between two towers separated by the channel. It must be stated that at that epoch the ships of the largest tonnage had only 19.7 to 23.0 ft. breadth of beam.

The use of piers was then habitual, as it is in our days, either to protect passage in storms or to maintain the depth of the channel and prevent it from filling with sand. The substructures of the western pier at Dieppe are very ancient and existed before the 16 th century, since at that epoch this pier was partly rebuilt. But the small resources then at dis-





disposal for undertaking expensive works, now so common, when permitted by the location of the shores, caused that men profited by the mouth of a river or a pond in building a port; and then at need was established a channel of communication with the sea, when as frequent for salt ponds, the natural inlets were shoaled by sand or entirely closed. Thus the ponds forming the port of Aigues-Morts were placed in communication with the high sea. Thus S. Louis caused the canal of Bouc to be dug near Marseilles to allow ships to enter the pond of Berre.

#### PORTAIL. Portal.

Splays or stepped recesses arranged externally before the principal doorways of churches to form<sup>a</sup> shelter. What distinguishes the portal from the porch, is that the portal unlike the porch, does not present a projecting structure, but belongs to the doorways themselves. Although the doorways of the cathedrals of Paris, Bourges, Amiens, Rheims, Rouen, Sens and Senlis, are sheltered by deep arches even surmounted by gables, as at Amiens and Rheims, still one cannot give those projections the name of porch.

The portals of our great churches furnished the architects of the middle ages with splendid motives of decoration. They are habitually ornamented by numerous statues, figures and reliefs, on the splayed jambs, the voussoirs, and in the tympanums over the doors. This arrangement of the portals of churches belongs to our country, to the architecture coming from Ile-de-France in the 12<sup>th</sup> century, and certainly one recognizes in it the mark of a true and grand feeling for decorative art. To surround thus the principal doorways of churches by a world of statues and reliefs, sometimes forming a series of dramatic scenes, is a bold and novel idea that produces a grand effect, for one cannot furnish a place more favorable to statuary. The oblique splays, lighted by the sun in the most varied manner, give to the sculptures a relief, that seems to lend them life. Thus most of those grand portals, such as those of Notre Dame of Paris, Rheims, and Amiens, form real poems in stone, that always attract the attention of the multitude. (Arts. Cathedrale; Porte).





PORTE. Gate. Gateway. Doorway.

An opening at the level of the ground and serving for passage. Every gate is composed of two piers and a lintel or an arch. The jambs have a sill and rebates intended to receive the leaves or gates. We shall divide this Article into fortified gates of cities and castles; doorways of keeps and towers; gates of abbeys; doorways of churches, external and internal; doorways of palaces and houses, external and internal.

PORTES FORTIFIEES TENANT AUX ENCEINTES DE VILLES; CHATEAUX; MANOIRS.

Fortified Gates belonging to Walls of Cities, Castles and Manor Houses.

There still exist in France some Roman and Gallo-Roman gates, that present the character of a passage pierced in a wall and protected by defenses. Such are the gates of Nîmes, Langres, Arles and Autun; the former preceding the establishment of Christianity; those of Autun dating from the 4<sup>th</sup> or 5<sup>th</sup> centuries. These gates are all arranged on nearly the same plan. They consist of two passages, one for the entrance and the other for the exit of vehicles, with two passages for persons on foot; they are flanked externally by two principal towers forming pronounced projections. The gates of Arroux and of S. Andre at Autun are surmounted by an open gallery for defense, over the two arches affording passage through the wall, and that can serve for defense at need. The openings are on the public street and were only closed by wooden leaves, without portcullises and drawbridges.

Note 1.p.314. The traces of portcullises appearing in the piers of these gates date from the middle ages.

Gate S. Andre at Autun is the most complete of all that we possess in France, and approaches the epoch of the middle ages.<sup>2</sup> It is further entirely designed on the antique model and has two entrances A (Fig. 1), two openings for persons on foot B, two towers C serving as military posts, with their two stairways D ascending to the upper stories.<sup>3</sup> One still finds on the road at A numerous fragments of that Roman pavement in great irregular blocks. At the two posterns B were established sidewalks, and at E was excavated a wide ditch, whose section may yet be seen. The road formed a causeway that extended quite far into the valley, as if to show those arriving. The p





The principal work (Fig. 2) is built of great blocks of sandstone set close without mortar according to the Roman method. In our Fig. 2 is seen the upper defensive gallery pierced by arches and communicating with the second story of the towers and the defensive gallery of the curtains. Those towers also possessed two other stories above ~~that~~ <sup>and</sup> reserved for defense, one covered by a vault, and the last open to the sky. Men ascended there by the stairs with double flights indicated on the plan.

Note 2.p.314. As we have stated above, this gate does not seem to date before the 3<sup>th</sup> century.

Note 3.p.314. The tower at the right alone exists up to the level of the top of the gate, but its stairs has been destroyed, and its traces are no longer visible.

We have been frequently asked when seeing the gates of the cities of Pompeii, Nimes, Autun and Treves, all so well arranged for the entrance of chariots and footmen, why men since pretend to return to the forms of Greek and Roman antiquity, they have never adopted this natural system of twin openings? The reply to that question is, that there is a sort of conventional antiquity, whose imitation they pretend to require. To place a pier in the middle of a street would seem to permit a enormity in the eyes of persons, that have thus falsified the spirit of antiquity. Many honest men regard the gates S. Denis and S. Martin at Paris, so little intended for the passage of carriages, as being what is conventionally called a happy inspiration in accordance with the rules of antiquity. But for the honor of the antique art neither Romans, Byzantine or Greeks nor Gallo-Romans ever erected such badly arranged city gates. Their gates are wide, double, and never have a height below the keystone greater than that of a very heavily loaded wagon. They are accompanied by posterns or smaller gates for persons on foot and are deep, i.e., forming a passage quite long, more than that for the openings for wagons, to permit a necessary stoppage. Sometimes these posterns are even accompanied by benches and arches opening on the passage for wagons. For example, such is the arrangement of the gate of Augustus at Nimes.

The towers and ramparts adjoining the gate of S. Andre of Autun are built of concrete faced externally and internally





by a facing of little cubes of rubble according to the Gallo-Roman method. Although the details of this gate drawn and executed but moderately, the entirety of this structure and its proportions produce the most happy effect.

But one conceives that these gates were not sufficiently covered, closed and defended to resist a regular attack. It is true that in time of siege, there were established before these entrances works of earth and wood, a sort of barbican that protected the wide gates. Those works of earth with ditches and palisades sometimes extended very far into the country, forming a vast triangle with the rampart of the city as base, and whose apex was protected by a tower or post of masonry. Even at Autun, on the other side of the river Arroux, is one of these great triangular works of earth, whose two sides end at two bridges, and whose apex was protected by a great square work of masonry, known today by the name of the temple of Janus, and that in reality was only an important post holding the important point of the bridgehead. What remains of that square tower fully shows that it was without gates at the level of the ground story, and that one could only enter there by an opening made in the second story, and by means of a ladder or a movable wooden stairs.

When Gallo-Roman soil was invaded by Hordes from the north-east many open cities were fortified in haste. They destroyed the great monuments, temples, amphitheatres, to build ramparts with gates flanked by towers. One still sees at Vesone (Perigueux) near the old cathedral of the 10 th century one of those gates. Not long since they still existed at Sens, Bourges, and in most cities of the East and Southeast on Gaulish soil. Many of those works were built of wood, as for example at Paris.

When later the Normans threw themselves upon the country under the rule of the Carlovingians, the cities must again establish in haste the external defenses to resist the invaders. These works must have had no great importance, for it does not appear that they opposed very serious obstacles to the assailants; contemporary reports also generally present them as having been built of wood; and further the art of defense of places had not had opportunity to develop under the first Carlovingians.

Only with the regular establishment of the feudal system was





that art elevated to the point, to which we see it arrived during the 12 th century. The remains of the gates of the walls of cities or of castles preceding that epoch, always modified later, however indicates already a well understood defensive arrangement. These gates then consist of round-arched openings allowing just one wagon to pass, i.e., they have scarcely 9.8 ft. in width by 9.8 to 13.1 ft height under the keystone. It was then no longer a question, as in cities built during the Gallo-Roman epoch, of opening wide gateways to commerce, to those going or coming, but on the contrary to make the openings as narrow as possible in order to prevent surprises, and to be able to guard them easily. Great and strongly projecting towers protected these gates.

We find no complete example of gates of cities or of castles before the beginning of the 12 th century. One of those examples, coming down to us without any alteration, is seen at the castle of Carcassonne, and it dates back to about 1120. We give (Fig. 3) the plan of that gate in the ground story. One reaches the entrance by a bridge defended by a great barbican built in the 13 th century.<sup>1</sup> The floor of that bridge A, whose parapets are crenelated,<sup>2</sup> is interrupted at B, and leaves before the entrance a ditch about 9.8 ft. long by 9.8 ft. wide. A movable floor, raised in case of siege, covered this void. The gate is only 6.6 ft. wide by 7.5 ft. high, and is surmounted by wide machicolations and closed by a portcullis C, a door D and a second portcullis E. A post placed in the hall F of the left tower had its entrance at G under the passage. A second post H was placed in the right tower, and had its entrance under a portico opening on the internal court of the castle. At K is a very wide ditch. Slots arranged in the two rooms F and H command the entrance and the exterior. One could ascend to the upper stories of this gate only by wooden stairs placed along the internal surface of the work at I. The plan (Fig. 4) is taken at the level of the chamber O of the second portcullis falling in the grooves P also forming machicolations. Two square holes R are pierced in the floors of the two rooms in these towers and pass through the vaults of the rooms of the ground story, and correspond to two other holes pierced in the vaults of the second story, so as to place in communication the defenders posted in the upper story with the men serving the second portcullis and with the men of the lower posts.





Those holes are 2.1 ft. long by 1.6 ft wide and even allow placing ladders in case of need. But they were pierced especially to facilitate command, that was always given from the upper part of the defenses. Fig. 5 presents the longitudinal section of the gate made on the axis. One sees at B the interruption of the floor of the bridge; at C is the chase for the first portcullis, and at D the chase for the second. The first portcullis is worked from the upper story at F, placed directly under the floor reserved for the defenders. The second portcullis is managed from the chamber, whose plan we have given. (Fig. 4). The holes for the wooden defensive gallery are visible at G.<sup>1</sup> Before the first portcullis is arranged a great machicolation; a second machicolation is pierced before the second portcullis. At H we give the section of the chamber of the portcullis made on the line a b c d of the plan (Fig. 4), with the vaulted halls of the ground and second stories. The section (Fig. 5) also shows the wooden stairs, that permit ascent from the court of the castle, either to the chamber of the portcullis or to the upper story. A first wooden gate was placed at I on the bridge before the ditch, to command the floor of the bridge from there. That space before the first portcullis was sheltered from arrows, that might be shot by the assailants, by a little shed roof; also allowing to pass the projectiles falling from the first machicolations. Thus in case of attack, a guard posted on the movable floor covered with projectiles the fixed floor of the bridge. If one foresaw that the gate I would be forced, the movable floor was dropped. From the top of the tower could easily be seen the arrangement for the attack, the portcullis was dropped and the door behind it was closed, and at need the second portcullis was ordered to be dropped. Then the entire defense was made from above, either from the wooden galleries, by the slots, or by the great machicolations. If desired to take the offensive and make a sortie, from the top came the order to raise the second portcullis, the men were massed in the gate passage, a foot-bridge was prepared, the portcullis was raised and the door was opened. If repulsed, they sometimes returned with the enemy behind them, but not dropping the first portcullis, the most advanced assailants were separated from the column massed on the bridge, and they were made prisoners.





Note 1.p.319. Art. Hourd, Fig. 1.

Fig. 6 is a perspective view of the gate taken from the bridge, assuming the wooden defense and its shed to be removed. On the flanks of the towers are seen the two corbels intended to support the rear beam and its shed roof. The first portcullis is assumed to be removed and the ditch is not covered by its movable floor. Except the portcullises, that are omitted, but all their attachments and more of suspension are visible, this gate has suffered no deterioration. It must be added, that the ditch has been replaced by a modern vault. This structure is made of small blocks of yellow sandstone, and is executed with great care. The rooms are covered by domes of well cut rubble- the roofs covering this entrance have recently been rebuilt in the form indicated on the longitudinal section.

The means of attack of strong places of that epoch adopted, means only consistent with a sap, very lengthy and dangerous since it was impossible to breach by battering the towers and curtains, whose walls had such great thickness, caused that the assailants always sought to attempt an assault or to surprise the enemy. If the towers and curtains projected too much to make it possible to attempt scaling, especially when the parapets were equipped with wooden defensive galleries, they attempted to enter the place by surprise or by a sudden attack on the gates. Hence the besieged accumulated means of defense at the gates; the portcullises were doubled, doors and obstacles, and the windlasses of these portcullises were separated, so as to render treason more difficult. Thus in the example just presented, one sees that the first portcullis is worked from the top, i.e., where all the defenders of the gate are collected, where there is necessarily found the captain. The men charged with this work being thus surrounded by most of the post, and under the eyes of the commandant, could betray it with difficulty. The chamber of the second portcullis is entirely separate from the first windless. The men charged with working the second portcullis could not see what passed outside, and could have no understanding with those posted at the first windlass. They could even be shut up in that chamber. Thus were avoided chances of treason; for it must be stated that these defenders like the assailants of a place were





enlisted everywhere, and those troops of mercenaries were disposed to sell themselves to the best bidder; many places were taken by treason of a post, and all arrangements by military architects must tend to prevent relations of posts charged with working the closures with the outside, to isolate them completely or to place them under the eye of the captain.

Surprises of places by the gates were so frequent, that not only were obstacles multiplied, the closures in the length of the opening, but outside were also placed barbicans, advanced works that made approach difficult, that compelled those entering to make detours, and cause them to pass several posts.

Today, when a place is regularly besieged, the first parallel is established at 1970 or 2625 ft., then gradually proceeding to the point of attack by tranches, breaching batteries are established as near as possible to the counterscarp of the ditch; the besiegers with artillery pay little attention to the gates, except to prevent the besieged from using them to make sorties. But when the attack on a place could be serious only at the moment when the miners reached the ramparts, one conceives that the gates became weak points. The definite attack being extremely close, every opening and exit must incite the efforts of the besieger.

In studying the fortified gates of places in the middle ages, it is then very important to recognize the exterior and to seek traces of the advanced works protecting them; for the gate itself, however well fortified it was, is always nearly a last defense preceded by many others.

The gate Laon at Coucy-le-Chateau, from that point of view is one of the most beautiful conceptions of military architecture of the commencement of the middle ages. Like the ramparts of the city and the castle itself, entirely built at the beginning of the 13th century by Enguerrand III, lord of Coucy,<sup>1</sup> it gives entrance to the city opposite the plateau that extends from Laon. This gate is placed opposite the tongue of land that connects the plateau to the city of Coucy, and gives entrance into the city nearly on a level; but because of that situation itself, it requires to be well defended, since that tongue of land is the only point by which one could attempt to attack the ramparts, dominating considerable precipices around the rest of its perimeter. At the beginning of the 13th cent-





century, here is a defensive system of the approach to the gate. (Fig. 7).

Note 1.p.322. The gate Laon at Comcy is of a date a little earlier than the construction of the castle. Naturally the wall of the city must precede the erection of the castle and the famous keep; this gate by its style and structure belongs to the first years of the 13th century. Enguerrand III took possession of his domain about 1183 and died in 1262.

At A was traced the road to Laon, now transferred to B; at C was a road descending into the plain and going toward Chauny.<sup>1</sup> At D was a great barbican in which united the two roads to reach a viaduct E, admirably built on pointed arches. This viaduct ended at a tower G, built on the axis of the gate H. From the junction F of the two roads to the point E, this viaduct rises in a sensible slope toward the city. It was level from the point E to the threshold of the gate, and from that threshold to the point H, there also existed a slope beneath the entrance passage. From the lower rooms of that gate by first a subterranean tunnel pierced under the passage, and by openings pierced in each pier of the viaduct, one reached the level D of the barbican beneath the upper road. Thus from the city and without opening any of the portcullises and doors of the gate itself, without lowering the drawbridge, and without opening the doors of the openings of the tower G, the defenders could spread in the enclosure of the barbican, could go to the exits L and K, to the corner tower P and on the raised defensive walks with palisades. If the barbican were forced, the defenders could return to the city under the viaduct, without being obliged to open the leaves of the gates of the tower G, or the portcullises of the principal work. Later, about the end of the 15th century, the beautiful faced rampart still entire was constructed on the site of the tower G, whose substructures thus remained in the middle of the terrace; the viaduct was maintained and partly enclosed within the masonry of the rampart. The plan (Fig. 8) gives the entirety of these successive constructions. This plan is taken at the level of the lower story of the gate. One descends from the city by two stairs A into two low halls B, and from those halls into the subterranean tunnel C. The length of the viaduct is followed over the drawbridges D between the piers, to the gr-

987. Not as now exposed and one itself, sufficiently well



great barbican and passing through the lower story of the tower G. We shall soon see the detail of the part of this passage with the gate, and of the drawbridge placed at E. Our plan gives in lighter tint the rampart built about the end of the 15 th century, and which is of great interest for the history of defenses applied to artillery.<sup>1</sup> Then the engineers used the subterranean passage to reach the lower galleries and the rampart. They only closed the arches I by masonry and filled the passage to the drawbridges. At the bent part the viaduct only served as a bridge crossing a ditch to reach from the plateau to the level of the platform of the rampart.<sup>2</sup> The spaces K formed a ditch separating the plateau from the city and descending at right and left to the natural precipices. The lower galleries of the rampart are indicated on the plan, and were pierced by numerous slots covering the bottom of that ditch with cross fires. This view of the entirety of the defenses of the gate Laon at Coucy very clearly shows the importance of this military post, and how it was powerfully defended. Let us now examine the gate itself, sufficiently well preserved today that one can judge of the system adopted by the constructors.<sup>3</sup> The plan (Fig. 8) is taken below the pavement of the city, so that the floors of the two rooms forming cellars without vaults and of the two circular rooms V are above the level of the bottom of the ditch K. These rooms were intended to serve as storerooms, and men descended into them only through two traps opened in the floor and in the recess P.

Note 1.p.323. That road is still visible.

Note 1.p.324. Art. *Meurtriens*, Fig. 11.

Note 2.p.324. We have only vague information concerning the tower G, now buried in the rampart beneath the present road to Laon, not having been able to make extended excavations. As for the viaduct, it is complete and is apparent in the middle of the additions of the 15 th century.

Note 3.p.324. This gate was terraced in the 15 th century at the time of the religious wars, to be able to place artillery at the tops of the towers. Those fills were removed several years since by the case of the commission of historical monuments, and that removal allowed one to discover the original arrangement, which we present in this series of engravings.

Fig. 9 gives the plan of the gate at the level of the pave-





pavement of the city. This plan shows the passage for wagons and footmen, narrowing toward the outer entrance.

This passage has a pointed tunnel vault at A, B and C; it is covered by a floor at D. The entrance F is closed by a raised bridge G, and at I was a door in two leaves with bars. From the corridor D one passed toward the city through side doors into two halls J, serving as guard rooms. One will observe that the two entrances into these halls from the passage are arranged, so that one cannot see the interior of the posts, nor consequently determine the number of men contained in them. Those posts are warmed by two fireplaces K and are lighted by two windows L placed over the two descents to the cellars marked on the subterranean plan. From those two posts J one passed into the circular rooms M, each pierced by three slots, two on the ditch and one on the passage.

At N is one of the traps opening into a shaft corresponding to the cellar story. Two stairs are made in the thickness of the walls of the towers to permit one to ascend to the second story, whose plan (Fig. 10) presents an arrangement perhaps unique in the art of fortifying gates in the middle ages. The two stairs just mentioned land at A in two passages opening into the defensive galleries R of the curtains and into the circular rooms B. From those round rooms one ascends by two stairs D to the machicolations M pierced between the two portcullises. The round rooms are each pierced by three slots looking outward,<sup>1</sup> and by a window F looking on the city. They are further furnished with fireplaces C. By the corridors E one either reaches the great hall S, lighted by 5 windows next the city, or the screw stairs that ascend to the upper defenses. Privies are arranged at L and a vast fireplace opens at K. One will agree that these arrangements, either as defenses or as posts, are remarkably extended. The great hall S being 72.2 ft. long by 26.3 ft. wide, could serve as a dormitory or assembly hall of a guard of 25 men, without counting the defenders watching in the posts of the ground story and in the three stories of the circular rooms. Thus a post of 50 to 60 men could easily stay in this work in ordinary times, and in case of attack it would be easy to double that number of defenders without encumbering it. If one continues to ascend the two screw stairs, he reaches the second story (Fig. 11), and

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enters either the two circular rooms A or the two turrets B, giving admission to a crenelated defensive gallery C on the city side, and allowing the defenders to watch the vicinity of the gate inside. The halls A are each pierced by two slots and a window F, communicating with the working of the portcullises at H and the defensive gallery at D by two passages G. Again ascending the screw stairs one reaches the fourth story (Fig. 12), which is the story particularly devoted to defense. By the corridors A one enters the round room B, passes into the defensive galleries furnished with wooden galleries C, or the inner defensive gallery P. From the circular rooms, or from the outer defensive gallery C, one reaches the working of the drawbridge located above the outer gallery protecting the gate.

Note 1.p.327. Art. Meurtriére, Fig. 6.

Making a section on the axis of that gate, i.e., on the line a c of the last. Fig., one obtains Fig. 13.

This Fig. indicates the principal arrangements of that work. A is the ground of the city. One will note that the floor of the passage is very much inclined toward the entrance to give more strength to a column of defenders opposing assailants, that have been able to cross the bridge and raise the portcullises. At B is seen in section the subterranean passage ending at the exit postern C, that is placed in communication with the passages made through the piers of the bridge. A drawbridge is hinged at C and fitted with a counterpoise, when dropped allows one to descend the stairs D. From that point it is necessary to work a second drawbridge to pass the spaces E, F, between the piers D, G, H. And thus either by drawbridges or by plank foot-bridges, that can easily be removed, one passes through the tower G of the general plan (Fig. 7) and reaches the great bastion D. The floor I of the bridge (Fig. 13) was interrupted at J and replaced by a drawbridge, not combined like those of the end of the 13<sup>th</sup> and succeeding centuries, but composed of a floor hinged at K, two timbers hinged at L, and two chains passing through the machicolations of the outer defensive gallery M; then these chains each divided in two parts, one coiled on a windlass and the other terminated by a weight. It was then at the level of the wooden defensive galleries that the drawbridge was worked, i.e., above the machi-





machicolations M of the gallery. As for the two portoullises, they were managed from a single windlass; the chains coiled in inverse directions on this windlass, by means of a very simple mechanism, permitted raising one of the two portoullises before the other, but never together. It sufficed for that, when the portoullises were lowered and consequently no longer pulled on the windlass, to unhook the chains of the portoullis that one did not wish to raise, then turning the windlass in either one direction or the other. One of the portoullises being raised, it was fastened, its chains were unhooked and those of the second were attached, then turning the windlass in the opposite direction. It is unnecessary to say that the counterpoise facilitated raising it as always. To lower the portoullises, the chains were hooked on and one of the portoullises was allowed to run down gently by the windlass, then the other. The absolute order that only one of the two portoullises should be raised at a time was another security, and we have seen this system adopted only in this work.

But it is necessary to examine in detail the mechanism of the bridge and of the portoullises.

At A (Fig. 14) we give the plan of the chamber for raising the portoullises to the level a of the section, and at B is the plan of the platform for raising the bridge, at the level b of the same section. One will first note that the interval separating the two towers, and which covers the entrance, gives in plan a part of a circle. Two corbels c project on this portion of the cylinder and support a wooden defensive gallery d, fragments of which exist in place. This gallery was placed on two horizontal timbers e, and consisted of a wall of thick timbers E represented in section. At each side on the sides of the towers were fixed two pulleys F intended to direct the two chains of the bridge, and to prevent them from rubbing against the gallery or the masonry. Above these pulleys at G the chains divide in two branches; one at H coils on the windlass T by means of a directing pulley h, the other at I was stretched by a counterpoise K. Turning the windlass from f to g rolls up the chain and raised the drawbridge. That work was aided by the counterpoise K. When this weight had descended, the bridge was completely raised. To lower it the windlass was turned in the opposite sense. On the plan B is





indicated the position of the windlass, and by dotted lines the horizontal position of the chains; the carpentry truss b being placed at m on this plan. A second machicolation existed at p. To work the two portcullises, there were placed at right and left two twin beams n (see plan B) on cross beams, (See the section), themselves resting on two corbels s (see plan A). These twin beams each received two double pulleys t t', t being intended to receive the two lifting chains and t the counterpoise of the outer portcullis; t' for the lifting chains and counterpoises of the inner portcullis. The section shows the windlass V with the attached lifting chain of the inner portcullis, the portcullis O being raised and consequently its counterpoise is lowered; the lifting chain of the outer portcullis being unhooked, which is lowered with its counterpoise R at its highest point, the two lifting chains coiled on the windlass at X, (see plan A), the cranks being f fastened at Y. The construction being preserved today up to the level N, the fastenings of the corbels are visible, and for the upper part we have found fragments, that sufficiently indicate the details.

Nothing in this mechanism is more than very primitive; but what is important to note here is, that these arrangements so perfectly appropriate for the needs, and then even retaining a monumental appearance, that certainly has not been sought. It is evident that the architect authors of such works were subtle men, that reflected maturely on what they had to do. At all points the passages and exits are placed exactly in view of the service of the defense, have only the widths and heights necessary, and the architecture is indeed only the exact expression of the programme. Yet on the exterior the appearance of that defense is imposing, and recalls under another form those beautiful antique structures of primitive peoples.

Fig 15 gives the external elevation of the gate Laon at Coucy, the bridges being assumed lowered and the portcullises raised. The wooden defensive galleries of this work were evidently permanent and supported on stone corbels, like those of the keep of the castle.

The entire masonry is built in courses of limestone from the basin of the Aisne, of excellent quality. Roughly dressed, the those courses are separated by thick mortar joints, and the





rude appearance of these surfaces also adds to the effect of this grand structure. When one compares these works of Coucy, the keep, castle, the gate Laon, the ramparts and towers, to the works similarly erected about the same epoch in Italy, Germany and England, then he can recognize among us the hands of a powerful people, endowed with spirit and rare energy, and one asks with some sadness how it happens that those beautiful and noble qualities are scorned, and that the narrow and exclusive spirit could be able to repudiate such works by casting them into the limbo of barbarism?

A transverse section made on the axis of the towers on the passages opened on the machicolations and on the room for raising the portcullises (Fig. 16), shows the interiors of the circular rooms in these towers, the passage A on the defensive galleries of the curtains, the section B of the wooden defensive galleries, and the entire system of defense of the interior.

A last Fig. will complete this entirety, on which one could publish a volume; this is the elevation of the inside facade of the gate next the city (Fig. 17). The wide arch with doubled vousoirs, that gives admission to the passage has a grand effect. The great hall of the second story is well accented by those 5 rectangular windows with mullions, and the two angle turrets about this simple structure in the happiest fashion. This facade is crenelated at top and shows very well that the gates of places well defended could actually take the places of small citadels and defend themselves at need against the citizens desiring to capitulate in spite of the garrison. Then the gate is always an isolated post commanded by a sure chief, and also able to resist in case of treason or of scaling the rampart. We emphasized in Art. Architecture Militaire the importance of these isolated posts in the defensive system of the middle ages, and it does not seem necessary to return to that subject here.

Leaving aside for the moment the works of less importance but of the same epoch, i.e., of the beginning of the 13th century, we shall examine how in the space of a century, these arrangements could be modified in the construction of gates of like strength.

On the eastern side of the city of Carcassonne exists a gate





defended in a formidable manner, and designated by the name of gate Narbonne.<sup>1</sup> That gate and the entire work attached thereto were built by Philip the Bold about 1235, when that prince was at war with the king of Arragon.

Note 1.p.336. Art. Architecture Militaire, Fig. 1-1; also Archives des monuments historiques.

We present (Fig. 13) the general plan of that entrance with its barbican and its surrounding defenses.<sup>2</sup> Gate Narbonne is indicated at E and has no drawbridge; it opens on a level with the exterior, following quite a steep slope from outside to inside, and according to the defensive method of these works. Movable bridges only exist at B on piers crossing a wide ditch outside the barbican A. After traversing that bridge, the comer presents himself obliquely before the first entrance C of the barbican, closed only by folding doors. That entrance C was flanked by a fort D of the outer enclosure, that completely commanded it. Another redan L with a strong turret on the internal rampart, commanded outside that entrance C within reach of crossbows.<sup>3</sup> Turning to his left, the comer found himself before gate Narbonne defended by a chain, machicolations, portcullises, folding doors, a great internal machicolation G, a third machicolation I, a second portcullis and wooden doors. Two slots H are pierced in the passage between the two portcullises, and belong to two rooms F in the ground story, that are entered by the doors V. Those halls are each still pierced by five slots. The attackable part of the towers of the gate is reinforced by spurs or beaks N, each pierced by a slot O. We have explained elsewhere<sup>4</sup> the special purpose of those spurs or beaks. They compelled the assailant to keep away from the tangent, and placed him under the arrows of the besieged. They neutralized the effect of the battering rams on the only point at which the besiegers could work them with success. To pierce the point of this beak by slots on a level with the external ground was also one means of preventing a close attack.

Note 2.p.336. This plan is at the scale of 1 : 500.

Note 3.p.336. Art. Echouquette, Fig. 6.

Note 4.p.336. Art. Architecture Militaire, Fig. 24.

From the rooms F two screw stairs ascended to the second story, from which men worked the portcullises. Under those rooms are made fine cellars for provisions.





Wooden palisades P prevented free passage from the lists b between the outer and inner ramparts, and did not allow approaching on foot the inner curtains at M and K. The patrols could only pass by the barriers N to perform their night service. An enormous tower is indicated at the bottom of our Fig. and is called the tower of Treau,<sup>5</sup> it commanded these lists and also served as a support for the gate Narbonne by striking the exterior over the external enclosure.

Note 5.p.336. Art. Construction, Figs. 149, 154.

Fig. 19 gives the plan of the second story of gate Narbonne. The two screw stairs that we have seen indicated in the ground story and in the two rooms A. These two rooms are vaulted like those of the ground story and each has a fireplace C with oven. From these two halls one can leave by the two doors B on the defensive gallery D, rising to the level of the terraces E of the curtains by great flights of steps. By the two passages G one enters on a level the central hall F, in the midst of which opens the great square machicolation I. Assuming that the assailants have been able to penetrate to the second portcullis by forcing the first obstacles, one could overwhelm them with projectiles and burning materials; the defenders charged with that office remained behind in the recesses K, and thus were perfectly sheltered from the arrows, that could be shot by the enemy, or protected from the smoke and flame of the materials piled in the passage. By the two bent passages L the besieged passed to the front machicolations M. From that room F was worked the first portcullis N, and men served the third machicolation O. Continuing to ascend the stairs H from the second story, one landed nowhere but reached a precipice, so that assailants having been able to penetrate into these stairs in the ground story found the doors closed and barred in the second story, and continuing to ascend the steps to reach the upper story, found themselves caught in an actual mouse-trap. To ascend to the third story, that of the defense, it was necessary to cross the rooms A and to seek the screw stairs R, that alone ascended to the battlements. To serve the second portcullis, it was necessary to pass the doors B and to reach the platform P. The servants of that second portcullis received orders from within by a little window pierced above the machicolations O. The two rooms are





pierced externally, one by three slots and the other by four, and lighted by two windows in the side next the city. This description sufficiently makes known the minute care devoted to the establishment of this gate. But the longitudinal section made on a b, that we present (Fig. 20), will make this description even clearer.

That section shows at A the chain suspended at one side of the gate from a ring fixed to the side of the tower and passing into the other tower through a hole and held by a bar inside, when one wished to stretch it. The chain was an obstacle employed in ordinary times, when the portcullises were raised and the doors opened, to a troop of cavalry that might wish to throw itself into the city. Even in time of peace, men feared and had reason to fear surprises. At B is the first machicolation pierced before the portcullis and shown at M on the plan of the second story. At C runs the first portcullis, served in the square central chamber. At D is the first wooden door with one leaf, ironed and barred, as shown in the Fig. At E is the slot commanding the passage, and above is the great square central machicolation with one or the recesses described in the preceding Fig. At F is the third machicolation pierced before the second portcullis; at G is that second portcullis worked from the outside and sheltered by a hood P. Finally at H are the last doors. From the room in the third story by the opening I could be directed the working of the portcullises; for it must not be forgotten that command was exercised from above. A formidable system of double machicolations in wood and of wooden defensive galleries further defended the approaches to the gate in time of war. The fastenings of that carpentry work are perfectly visible today. Then in case of siege were established before the machicolations B double defensive galleries with the first machicolation K and a second machicolation L. This double wooden defensive gallery was covered and crenelated for arches. It formed a hood over a niche in which is placed a very pretty statue of the Holy Virgin. One can descend into that double gallery only by the opening N and ladders, so that of these galleries were taken by scaling or burned, the assailants would then not be masters of the defense. In the upper part we have drawn the wooden defensive galleries are paleed. The entire





active defense is organized on the upper story M, the story O only serving for deposits and as a hall for collecting the garrison. That hall O is abundantly lighted by beautiful windows in the side next the city.<sup>1</sup> We give (Fig. 21) the plan of the upper story M, whose floor was of wood. W N is the defensive gallery, and at X a part of the wooden defensive gallery is in place.<sup>2</sup>

Note 1.p.339. Art. Fenetre, Fig. 40.

Note 2.p.339. This plan is at 1 : 500.

Fig. 22 presents the external elevation of gate Narbonne with its great wooden defensive gallery over the entrance of the wooden crowning galleries placed on the tower and curtain at the right. The left tower is presented with its battlements and shutters in time of peace.<sup>1</sup> All masonry of that work is entirely built of beautiful sandstone, greenish-gray and of good quality. The courses are chiseled along the beds and joints with a rough boss on the face; these beds are very well dressed and set on a bed of excellent mortar averaging 0.4 in. thick. The external and internal appearance of this gate is most imposing and the internal rooms are admirably constructed with beautiful droved surfaces. To be complete, that construction only lacked the roofs, which were rebuilt recently under the direction of the commission of historical monuments.<sup>2</sup>

Note 1.p.341. This elevation is at a scale of 1 : 400.

Note 2.p.341. For more ample details, see Archives des monuments historiques, published under the auspices of the Minister of the house of the emperor and fine arts.

Before leaving this edifice, so remarkable in all respects, it is necessary to take into account the working of the portcullises, still perfectly visible.

We shall take as example the second portcullis, that managed externally on the defensive gallery at the side next the city (Fig. 23). At A the portcullis is assumed as raised. At a are holes for fastening the two sides of the windlass at a' in section C. One still sees in place the two great eye-bars b in which was slipped around iron bar intended to maintain the counterpoises c, when lowered. Further, two bars e, sketched at e' on the section, and entering holes arranged for that purpose, supported the raised portcullis. The fastenings of the two timbers f intended to support the pulleys are intact.





When it was desired to lower the portcullis (see at B), by pressing a little on the windlass so as to remove easily the pieces e and to slide the iron bar passing through the eye-rods b; then it was dropped by loosening the two wheels of the windlass. The portcullis having fallen, the two iron bars g were unhooked, and their eyes h were fixed on two iron pins still fixed in the wall. Thus it became impossible to raise the portcullis from the bottom. Two great iron hooks fixed at l supported a cross-beam of wood from which was suspended the shed roof sketched in the section (Fig. 20), and into which entered the timbers f. The counterpoise made the working easy for two men working on the windlass. If it was desired to raise the portcullis, the eyes h of the bars were slipped off their pins, these bars were hooked into the links of the chain, and the men pressed on the windlass. That working was simple and rapid. The first portcullis was raised by the same means. It was only necessary to have the counterpoises well balanced, so as to prevent the portcullis from buckling in being raised or in descending.

It does not appear that this work was ever attacked, and since the epoch of its construction, history mentions no regular siege of the city of Carcassonne, although on several occasions the country may have been invaded, either by the troops of the Black Prince, by the troops of Arragon or in the civil wars. Indeed with the means of attack at disposal in the middle ages, the city was an impregnable place, the gate Narbonne, the only one accessible to wagons, could have defied all attacks.

When one examines this gate in all its details, besides the beauty of the construction, the grandeur of the internal arrangements, one marvels at the care devoted by the architect to every part of the defense. Nothing superfluous, no form not required by the needs; all is reasoned, studied and applied to the object. We know no edifice, that has a grander appearance than this broad flat facade looking toward the city. It is only a wall pierced by windows and slots, but is so well built, assumes such a grand air, that one cannot be weary in admiring it, and one asks whether the scrupulous observation of the architectural requirements is not one of the most powerful means of producing the effect.





The mode of attack of places must necessarily influence the arrangements given to fortified gates. When the besieging armies had not yet adopted regular and systematic methods to obtain possession of places, it is clear that their efforts must be applied to the gates. The first idea that came to the commander of the besieging army in times when no one possessed organized means of destruction, naturally was to enter the besieged place by the gates, and of concentrating all his means of attack on those weak points; so on the contrary the besieged then brought to the defense of those gates a minute care, accumulating at those points all the obstacles and all the resources that their subtle minds could suggest. Yet already about the end of the 12 th century Philip August had learned how to make regular sieges, conducted with system and like what the Romans would have done in such a case. During the 13 th century, some well directed sieges indicate that the art of attacking places was maintained at the point at which Philip August had brought it;<sup>1</sup> but progress is scarcely sensible, while the art of defense is perfected in a remarkable manner. At the end of the 13 th century, the defense of places had acquired an evident superiority over the attack, and when places are well equipped and well fortified, they can be reduced only by a close blockade. But from the beginning of the 14 th century, the engines being very perfect, armies acting with more system and harmony, we see appear in the art of fortification very important modifications. At first works in wood disappeared, that occupied so large a place in fortresses until this; and indeed by the aid of powerful machines, especially after the experience acquired in the East during the last crusades, they set fire to the wooden defensive galleries, however well covered they were with fresh hides or wet felts. Men renounced then first the movable wooden defensive galleries, established only in time of war, and replaced them by stone galleries and machicolations.<sup>1</sup> Since improvements made in the attack were sufficiently notable, that men no longer attempted to force the gates; then made mine galleries, undermined the foundations of towers, supported them with timbers, and setting fire to those supports, overthrew entire works. Men possessed destructive machines sufficiently powerful to batter in breach projecting points, or to cast into a place





such a great quantity of burning or infecting materials, as to render it uninhabitable. Therefore the defense of the gates assumed less importance. It no longer concerned more than protecting them from sudden attack, flanking them well, and giving them sufficient width that a troop might easily return after a sortie, or take the offensive in case of a repulse sustained by the besiegers.

Note 1.p.344. Art. Siege.

Note 2.p.344. Arts. Hourd, Mochicoullis.

Those narrow and low gates of the 12 th and 13 th centuries, so lavishly equipped with obstacles, assumed breadth; the little tricks accumulated under their passages disappeared, but on the other hand the flankings and advanced works are better and more broadly conceived; the external defenses sometimes became what are termed forts, i.e., actual fortresses placed across a passage.

During the last years of the 13 th century, Philip the Fair caused the erection of an important citadel opposite Avignon,<sup>1</sup> opening by a single gate at the accessible side, i.e., at the south and opposite the little city of Villeneuve-les-Avignon. That gate is flanked by two great towers crowned by machicolations. Its opening at the narrowest part is 13.8 ft., a width unusual for the gates of the 12 th and 13 th centuries. We give the plan of the ground story (Fig. 24). Between two pointed arches falls a first portcullis A, behind which at B swings folding doors. At C is a machicolation before the second portcullis D, behind which is hung the second folding doors. The crowning machicolations defended the first portcullis. One penetrates into the two towers by the doors E, closed by doors in grooves, worked from the rooms of the second story. The two portcullises A and D are worked from a vaulted room situated directly over the passage; two screw stairs ascend from the ground story to the rooms of the second and to the upper platform, which is paved with stone slabs above the vaults. On this platform over the room for managing the portcullises rises a little square structure with tunnel vault, the stone platform of which is reached by a miller's ladder passing through a trap arranged at the centre of the vault. In this construction all carpentry work was excluded, so as to remove that defense from the chance of fire. The construction





is treated with extreme care; built of excellent stone from Villeneuve in regular courses 10.6 ins. high, it has suffered no change. The vaults are built with the greatest perfection, thick, well filled on the haunches with excellent masonry. The two screw stairs open into the rooms, dungeons and privies, placed in the projections connecting these towers with the adjacent curtains. At the side of the left projection is seen one of those discharges from the privies falling outside. A drawbridge of a later epoch had been arranged before the first portcullis. The vicinity of this gate was originally defended by an advanced work, a sort of barbican represented in Fig. 25, giving the external elevation of the gate of Villeneuve-les-Avignon. This elevation shows at the centre a square structure that surmounts the platform and the crenelated tops of the screw stairs, that are on the right and left and serve as watch-turrets and complete the defense of the two projections. The top structure by its dominant position commanded the vicinity, and could receive one or two machines with a long reach. Machines, stone-throwers and mangonels could also be placed on the stone platforms of the towers. By suppressing carpentry roofs fires were avoided, and by installing casting machines the approaches were made more difficult; for those engines then fulfilled the purposes of our rampart guns. All leads to the belief that the two projections, that unite the towers with the curtains, were chiefly intended to receive formidable machines, which that position struck the assailants, who desired to approach the gate by the sides of the two towers. Indeed, thus were attacked the gates during sieges, after the 12th century. The besiegers avoided presenting themselves before these gates, always equipped in front. They formed their attack on an oblique line, covering themselves by mantlets, breastworks and galleries of wood, against the projectiles from the curtains; leaving the barbicans occupied by the defenders to close a tacks, they took them laterally and thus reached the base of the towers of the gates at the point most difficult to defend.<sup>1</sup> It was in foresight of this kind of attack that the military constructors made those projecting breaks or spurs reinforcing their gate towers at the attackable point, and compelling the assailants to keep away from the tangent; but from the instant that the tops of towers





could be equipped with casting machines of long reach, this means of close defense became superfluous.

Note 1.p.348. See Art. Pont, where are presented these works concerning the bridge of S. Penezet of Avignon.

Note 1.p.348. See Arts. Siège.

A section made on the axis of the passage of the gate of Villeneuve-les-Avignon (Fig. 26), will complete the knowledge of this beautiful work of truly imposing appearance. This section B indicates the groove of the first portoullis at M, the first door at f, the groove of the second portoullis at D and the second door at e. One will note, that according to accepted usage as far as permitted by the form of the ground, the ground of the passage rises from the exterior to the interior. Above the passage is seen the room for working the two portoullies, and over that room is the upper structure, surmounted by a machine with long reach. Before the second portoullis D opens a machicolation. Fig. A gives the cross section of the passage made on a b looking toward the entrance. At a still fixed the tree iron rings 9.8 ins. diameter., which served to suspend the pulleys required for working the chains of the first portoullis.

But the site of Villeneuve-les-Avignon is situated on a hill of abrupt rocks, and its gate opens opposite a buttress descending to the plain. In such a location, there is no need of ditches nor of very strong advanced works, for the site of the place already offers an obstacle difficult to conquer. The passage of men going and coming is limited to sorties and retreats of the garrison. The gate just presented above is then rather the entrance of a castle than that of a populous city, whose gates must be left open for the entire day. The gates of the city of Avignon in the 14 th century were indeed works arranged for a fortified city, but containing a numerous and active population.

The ramparts of Avignon were built from 1348 to 1364. They were pierced by several gates, either on the bank of the Rhone or on the side next the plain, among them we shall choose gate S. Lazare, one of those best preserved and for which we possess complete documents.

Note 2.p.348. To the courtesy of M. Achard, the learned architect of the prefecture of Vaucluse, we owe the greater part

of the building the same as in the case of the other  
in the building.

The 12th floor of the building was examined, it was found  
that it was a continuation of the 11th floor, and that  
it was a continuation of the 11th floor, and that  
of the building examined from that date to the present  
by the 12th floor of the building of the building, which  
is the building of the building.

The 13th floor of the building was examined, it was found  
that it was a continuation of the 12th floor, and that  
it was a continuation of the 12th floor, and that  
of the building examined from that date to the present  
by the 13th floor of the building of the building, which  
is the building of the building.

The 14th floor of the building was examined, it was found  
that it was a continuation of the 13th floor, and that  
it was a continuation of the 13th floor, and that  
of the building examined from that date to the present  
by the 14th floor of the building of the building, which  
is the building of the building.

The 15th floor of the building was examined, it was found  
that it was a continuation of the 14th floor, and that  
it was a continuation of the 14th floor, and that  
of the building examined from that date to the present  
by the 15th floor of the building of the building, which  
is the building of the building.

The 16th floor of the building was examined, it was found  
that it was a continuation of the 15th floor, and that  
it was a continuation of the 15th floor, and that  
of the building examined from that date to the present  
by the 16th floor of the building of the building, which  
is the building of the building.

The 17th floor of the building was examined, it was found  
that it was a continuation of the 16th floor, and that  
it was a continuation of the 16th floor, and that  
of the building examined from that date to the present  
by the 17th floor of the building of the building, which  
is the building of the building.



of the information that has aided us in restoring this gate in its primitive conditions

Gate S. Lazare of Avignon was destroyed, or at least very greatly damaged by a formidable flood of the Durance in 1358. It was rebuilt under Urban V about 1364, with the entire part of the ramparts extending from that gate to the rock des Doms, by one of the architects of the palace of the Popes, Pierre Obreri, if the tradition is credited.

Here (Fig. 27) is the general plan of this gate with the little fort covering it. There remain of these structures to-day only the gate A and the substructures of a part of the fort, but complete drawings of the advanced works have been preserved to us.<sup>1</sup>

Note 1.p.349. The drawings belong to M. Ashord, who was quite willing to allow us to copy them.

Those arriving presented themselves by a road B at the side of the fort; they must pass the first drawbridge C, cross the esplanade of the fort diagonally and cause the barrier D to be opened; to pass over a second drawbridge E, enter an advanced work F closed by a drawbridge and defended by two turrets with machicolations; present themselves before the gate protected by a line of upper machicolations, by a portcullis and by a second machicolation pierced before the doors. The fort was entirely surrounded by a ditch G filled with water, just as the great ditch H protected the ramparts. Those ditches were fed by the natural streams that surround the city and to the entire extent of the walls not facing the Rhone.

Three low towers flank the fort. One ascends to the upper stories of these towers and to the battlements of the curtains by the stairs K. A cavalier view (Fig. 28), taken from the point X of our plan, will show the entirety of this gate with its front defenses.

The three towers of the fort were vaulted and covered by stone platforms at the height of the battlements.

It is easy to see that the fort was open at the rear and was commanded by the front of the gate, just as this front work was dominated by the square tower crowning the last entrance. This work was then already constructed according to that rule of fortification, that what defends must be defended.

The longitudinal section made on the gate A of the plan and





the plan and the front work (Fig. 29) shows the details of this defense. At B is the lowered drawbridge, at C is the door that leads by stairs in the thickness of the wall to the battlements of the front work, at D is the groove of the portcullis; at G the machicolation that protects the doors H, at I the passage covered by a floor; the portcullis is worked from the landing K, to which one ascends by a stairs L placed on a projection from the lower wall; for it is necessary to note that the upper wall M is much thinner than the wall of the ground story. That stairs L further serves to relieve the stairs marked I on the general plan, and that ended in return beside the round arch supporting the windlass of the portcullis. By taking a wooden stairs from the landing K, one ascended to the upper story under the roof, and entered the defensive gallery of the battlements by the door P arranged in a stone lobby placed at the angle of the battlements. Each door of the ramparts of Avignon was furnished with a bell, so as to warn the defenders or the inhabitants in case of attack or surprise. If we make a transverse section on the line a b of Fig. 29 of the general plan, looking toward the entrance of the front work, we obtain the sketch S. The drawbridge being raised, its floor closes the opening T, and its arms passing through the two slots V, as marked at V' on the longitudinal section, nowise interfere with the defense. The middle crenelle and its two slots remained free, and the two lateral turrets flanked the gate. From the room in the second story of the tower, one passed to the defensive gallery of the curtains p by the doors N. On the side next the city a simple half timber wall pierced by openings enclosed the upper stories of the tower.

Fig. 30 gives at A the elevation of the work with the front work, and at B the elevation of the tower, making a section through the advanced work.

The gate S. Lazare of Avignon is already remarkable by the simplicity of construction. Here one no longer sees that accumulation of obstacles, whose complex arrangement must frequently embarrass the defenders. It is true that the gates of Avignon are not very strong, but they indeed have the character suitable for the walls of a great city. Gate S. Lazare, with its rampart or external barbican, efficiently protected a body or troops desiring to attempt a sortie, or obliged to fight





in retreat. One could easily mass 500 men on the esplanade of the rampart, protect their sortie by means of flankings furnished by towers; and if repulsed, they found in that enclosure a safe refuge, without disorder and a precipitate retreat being able to compromise the principal defense, that of the gate belonging to the curtains. Finally if the rampart had fallen into the hands of the besieger, the defenses were entirely open at the side next the city, and by means of the crenelated front work, the besieged could compel the assailant to shut himself within the three round towers and to leave the esplanades and curtains free, which facilitated an offensive return.

The arrangement of gates opened through the simple square tower without flankings belongs more particularly to Provence. It existed at Orange and Marseilles, and there still exist at Carpentras, and Aigues-Morts gates of the end of the 13<sup>th</sup> and the beginning of the 14<sup>th</sup> centuries, opened through square towers without turrets or little flanking towers; while the works of this kind that belong to the royal domain, with very rare exceptions, are furnished with round towers or pronounced flankings.

The little city of Villeneuve-sur-Yonne still possesses a very pretty gate of the beginning of the 14<sup>th</sup> century, that merits mention among many others by the arrangements of its flankings.

That gate was modified in the 16<sup>th</sup> century in its upper part by the new roofs, yet allows all its primitive arrangements to be seen. Fig. 31 gives its plan.

At A was a drawbridge flanked by two angular turrets forming spurs and solid in their lower parts. At B was a wide machicolation, now filled, that protected the first portcullis C. W. Wooden folding doors closed the passage at E. At G is the second portcullis preceded by a second machicolation, and at I is a second pair of doors. One ascended to the upper stories of the gate and to the curtains by the two external stairs H. At P were obliquely presented on the exterior two great machicolations, that swept the drawbridge, and through which passed the chains serving to raise the bridge. The sketch M gives the plan of the upper part of the gate. One sees the two flanking crenelated turrets, that connected the bridge and the o





outside; at N are the two oblique machicolations through which passed the chains O of the drawbridge; at S is the windlass serving to work the chains; at T is the upper defense dominating the entire work.

Fig. 32 presents the external elevation of the gate of Ville-neuve-sur-Yonne. This elevation illustrates the twofold function of the oblique machicolations. That entire structure is built of pebbles and grit with stone quoins at the angles. Perhaps to the goodness of the construction and to the small value of the materials we owe its preservation.

A longitudinal section made through the front part of the gate (Fig. 33) shows the working of the drawbridge and its mechanism. Counterpoises are suspended at the ends of the floor beams and facilitate its movements when the windlass T is turned. The first portcullis being lowered, the machicolation that protected it was open to the defenders. In this example, as in all those previously given, the defense only acted at the top of the gate, and by the arrangement of the turrets O and of the great oblique machicolations, the ditch and the vicinity could be covered with projectiles.

One understands that such a work, however small in extent it may be, must be very strong. Besides the curtains had a strong projection, and were reinforced on the front opposite the river by a great cylindrical keep, that still exists. The entire enclosure of this little city, so pleasingly located on the banks of the Yonne, was pierced by only four similar gates, two on the fronts upstream and downstream, one near the keep and the other opposite the bridge thrown across the Yonne. Six cylindrical towers placed at the angles formed to the curtains completed the defenses. As for the keep, it is separated from the curtain by a ditch, that bends in a semicircle to give room for it. It is connected to the defensive gallery only by a drawbridge, and was pierced near the exterior by a postern at the level of the counterscarp of the ditch.

In 1374 the king Charles V caused the rebuilding of the walls of Paris on the left bank removing very much the walls beyond the limits fixed under Philip August. This new wall nearly followed the existing line of the internal boulevards, and was pierced by six gates, that were in starting upstream, gates S. Antoine, Temple, S. Martin, S. Denis, Montmartre and S. Honore.





most of those gates were built on a square or oblong plan with flanking turrets. One of the most important, and of which engravings remain to us, was gate S. Denis.<sup>1</sup> "Our kings," says Du Breuel,<sup>2</sup> "when making their first entries into Paris, enter by this gate, that is decorated by a rich advanced portal, where are seen various admirable statues and figures, made expressly, with some verses and sentences in explanation of them. Also by this gate the bodies of deceased kings go out to be borne in funereal pomp to S. Denis in France." The gate S. Denis was built to project strongly from the curtains, and formed an actual fort, in which could be lodged a body of soldiers. In 1413 the duke of Burgundy presented himself before Paris at S. Denis with the intention of speaking to the king, he said; but as states the Journal d'un bourgeois de Paris sous le regne de Charles VI,<sup>1</sup> "The gates were closed to him, and were walled up as formerly, with this great abundance of men-at-arms to guard them day and night."

Note 1.p.357. See the tapestry at the city hall and the great birdseye plan of Merion, and the engraving of Israel Sylvestre.

Note 2.p.357. Book III. p. 1062, edit. of 1612.

Note 1.p.359. Collection Richard. Vol. II. p. 641.

Indeed most of those gates were walled up several times during the wars of the Armagnacs and Burgundians. Thus even at that epoch, the beginning of the 15 th century, one could not trust enough to the ordinary closeness of the gates of cities, that it was felt necessary to wall them up in case of siege. It must be stated that this means was particularly adopted, when was feared some treason on the part of the inhabitants. Then the gates became bastiles and forts, permitting the placing of numerous posts on the external ramparts.

The gates built at Paris under Charles V lent themselves perfectly to that service, as one can recognize by examining the cavalier view, that we give of gate S. Denis (Fig. 34). The great projection of this work from the curtains gave a good flanking for the time, and permitted the establishment of a false work with small ditch inside between those curtains, and the wide ditch fed by the river, now in part lost beneath the modern structures of the city.<sup>2</sup>

Note 2.p.359. The engraving of Israel Sylvestre shows the

...of the work with the ...



place of the false work with its ditch behind it.

This gate was restored or rather modified in the 16<sup>th</sup> century. The upper battlements were replaced by parapets destined to receive artillery. It was demolished under Louis XIV to give place to the triumphal arch that still exists, and which was connected to a system of curtains and bastions not walled.

Our cavalier view shows the little internal court, that was necessarily surrounded by slots in the second story, so as to cover with projectiles the assailants, that could force the drawbridge. The second story thus contained rooms at the four sides of the court, sufficient to house a very numerous garrison. Two stairs arranged in the rear turrets served these rooms and the upper crenelated story covered by a terrace. Probably the lateral arches were pierced by wide machicolations, and in their rear walls opening on the court opened slots enfiling the space between the false work and the curtains.

Besides, barriers and palisades defended the approaches of the bridge,<sup>3</sup> itself protected by crenelation and two turrets.

Note 3. Art. Barriere.

Like all works erected at Paris during the middle ages, these gates were well executed in masonry faced with cut stone, and possessed that grand monumental character, that indicates the great city.

That wall, pierced by beautiful gates, rested at the east on the Bastille, built at the same time, but finished only at the beginning of the reign of Charles VI.<sup>1</sup>

Note 1. p. 360. Art. Bastille.

About the beginning of the 15<sup>th</sup> century, the art of fortification of places tended to be modified. Du Guesclin had taken by strong force such a great number of places without resorting to the regular method of siege, that it was necessary thenceforth to seek to keep off assailants by extended advanced works, especially before the gates; works forming large ramparts sometimes connected together by pits or simple palisades. Men recognized at the moment when artillery began to play a part in sieges, that it was important to cover the approaches and gates by terraces or thick walls of small height, commanded by curtains and towers.

There exist at Nevers a beautiful gate of the end of the 14<sup>th</sup> or the first years of the 15<sup>th</sup> centuries, that possesses





very apparent remains of the great advanced work that protected it. The gate of Groux (for thus it is named) consists of the rampart H with a thick wall B on the covered way from which one ascended by a stairs C made in the thickness of one wall of the guard wall D, which flanked the external gate E, protected by a ditch F and closed by a drawbridge. This first entrance was enfiladed by a curtain D". A body of troops could be massed in that area A, which had nearly the form of a bastion, and which was placed in direct communication with the road G only by a postern H. If the assailants succeeded in forcing the first gate E, they found themselves taken in flank by the defenders lodged in A. Perhaps there formerly existed a flying bridge placing the rampart A in communication with the ramparts of the city. The space I was only a hill, and at K was excavated the ditch surrounding the walls of the place. The gate L of small extent flanked the curtains M. It was closed by drawbridges and doors at P. Besides the entrance intended for wagons, this defence possesses a lateral postern, with separate drawbridge, allording to a custom generally adopted after the 14 th century. The passage of the corridor was barred, although permitting the working of the arms of the little drawbridge, and was placed in communication with the city by the gate R, and with the great carriage gate by the gate S. Barriers were then placed at T, so that if one desired to send footmen or a guard into the city, only the drawbridge of the postern was lowered, and these men could be recognized by the guard posted at L before being able to enter the city. The passage of this postern by its irregular form made the passage of the men on foot more difficult, and caused that all the small gates being open, the man placed on the drawbridge could not see what passed beyond the defense in the interior of the city. Men came to the second story of the gate by the stairs O, and from that first story to the battlements and upper machicolations by the internal stairs of wood.

Fig. 36 gives the external elevation of the principal work. One sees in that elevation the two slots of the great drawbridge and the single one of the postern bridge. The fronts of the tower on the three outer sides are defended by crenelated machicolations, and the angles by two turrets, whose floors are raised a little above that of the machicolation. The lat-





latter are composed only of stone corbels with a thin crenelated wall set on their ends. Planks are laid on the corbels and permit the defenders to use the battlements and slots, and to drop stones between the corbels on the assailants.

We shall indicate the arrangement of the mechanism of these drawbridges of the 14 th and 15 th centuries. Let (Fig. 37) this be a gate with width and height sufficient to allow the passage of horsemen and wagons, i.e., according to the mode adopted in the 14 th century, about 11.5 ft. high and wide. This gate is presented at A as seen externally, at B as internally, according to a transverse section made across the passage. At C is one of the slots of the drawbridge as shown externally, and at C is masked by the internal wall of the room in the second story. The plan D made at the level a b explains the working of the drawbridge. It is raised by pulling on the chains E; then the rear end F of the beam I is moved by the weight and falls to F', after describing a circular arc, and the timbers I come to rest at I'. The floor K describes a circular arc on its pivots, rises to K' and covers the entrance; the timbers behind, the chains hang in the angle, and thus compel the floor to rest on the jambs and arch of the gate. It is well understood to be necessary, that the length of the chains is to be calculated to obtain this result, and to leave to the timbers an inclination, that facilitates the first effort in raising. The floor is composed of the frame of strong beams with X-braces, on which are nailed the planks. Another X-brace and cross beams solidly connect the two timbers inside.

At L we show one of the pivots of the timbers, and at M is the iron socket in the stone intended to receive those pivots.

In our days the working of the drawbridges is made easier and more certain by means of windlasses, pullies with chains after Vaucanson, but the principal has remained the same.

Drawbridges of posterns are raised by means of a single timber, at the end of which was suspended an iron fork receiving the two chains. But we shall have occasion to speak of these drawbridges when specially occupying ourselves with posterns. (Art. Poterne).<sup>1</sup>

Note 1.p.365. Also see in Art. Pont different systems of drawbridges.





The use of artillery against strong places compelled the modification of some of the defensive arrangements of gates after the 15<sup>th</sup> century; but then the siege artillery was transported with difficulty,<sup>2</sup> and most frequently besieging armies had only pieces of small calibre; or indeed if they succeeded in placing in battery mortars of very large calibre, this kind of piece only threw stone balls like shells, just as the machines with counterpoises. If those great projectiles in passing over the walls of a besieged place could cause damage, they did not breach and rebounded on the surfaces of the towers and walls, inefficient if the walls were thick and well built. Military engineers thus but moderately occupied themselves with modifying the old defensive system, as for the general arrangements, and had made few changes except in the battlements, so as to post musketeers there. We have an example of these alterations that one of the front gates of the little city of Flavigny. This gate (Fig. 38) is still flanked by two cylindrical towers pierced by slots at their bases, at mid-height and at the top. Those openings are made for very small guns and are round. The gate itself as well as its postern is surmounted by a machicolation with a parapet also pierced by round holes. This work precedes a gate of the 14<sup>th</sup> century, now partly demolished, and which was closed by a portcullis and folding doors.

Note 2.p.36. Arts. Architecture Militaire; Engin.

Fig. 39 gives at A the internal elevation of the gate presented externally in perspective in Fig. 38. One will note that at each corbel of the machicolation supports a stone wall that strengthens the parapet. That arrangement is further explained by the section B. It must be added that this gate opens at the top of a precipice and that the road leading to it has a very steep slope. In such a position, there was no need of ditches nor consequently of a drawbridge; the assailants presenting themselves before that gate had a precipice at their backs. However simple it is, this gate is a pretty example of the military structures of the epoch of transition, at the moment when the architects were preoccupied with the use of artillery.

Olivier de Clisson, brother in arms of du Guesclin, who made such disastrous war against the English, was a general of rare merit, who fortified a very great number of castles of Poitou,

and on the frontier of Germany. He stopped for the night at a small village, and then went on to a larger one, and finally to a still larger one, and so on, until he reached the capital. He was very tired, and he was very hungry, but he was very happy, and he was very content. He was very much interested in the people, and he was very much interested in the things that he saw. He was very much interested in the history of the country, and he was very much interested in the future of the country. He was very much interested in the people, and he was very much interested in the things that he saw. He was very much interested in the history of the country, and he was very much interested in the future of the country.



and on the frontiers of Guienne. He adopted for the defense of gates that system that seems to belong to him. He erected a round tower on a bridge, and pierced it by a passage closed by portcullises and folding doors. On the bridge of Saintes exists a gate of this kind,<sup>1</sup> and still to be seen in the provinces of the West. One of the gates of the walls of the castle of Montargis presents that arrangement, and the central opening of that tower is uncovered and allowed from the top of the tower the crushing of the assailants, who had penetrated therein between the two gates pierced in the opposite walls of the cylinder.<sup>2</sup> The round towers serving as gates, that appear to belong to the initiative of the constable Olivier de Clisson, are generally very high, i. e., giving a considerable command over the vicinity. They are isolated and are not connected to the curtains of the enclosures. They are little forts across a bridge, so that the besieged shut within these posts, having only very uncertain means of retreat, were more disposed to defend themselves to extremity. It very frequently occurred indeed, that becoming the object of a very violent and continued attack, and being gradually abandoned by the defenders, who found by way of the adjacent curtains, that they were a means of easily abandoning the system, on the pretext of extending the field of the defense. Shut up in an isolated tower serving as a gate, the garrison had no resource except to fight to the last extremity. The arrangement that seems to have been systematically adopted by the constable O Olivier de Clisson is further conformed to the energetic character and even ferocity of that warrior.<sup>1</sup> Thus many military works of the middle ages assume an individual appearance, and it is very difficult by some examples to give a survey of all resources found by the constructors. Thus we only pretend here to present some of the arrangements most generally adopted or most remarkable. Besides, it is not doubtful, that the military structures of the middle ages, the personal ideas of the lords causing their erection had a considerable special influence on the arrangements adopted, and that these lords in many cases themselves furnished the plans executed, such is the great variety of these plans. It is well to remark also, that if during the middle ages the constructions of churches and of monasteries are frequently neglected; that it is evident in





those structures, that supervision was lacking, but one cannot make the same reproach for military works. These, although very simple, or erected by the aid of means sometimes limited, are always built with extreme care, indicating the most assiduous supervision, the direction of the master. Due to that good execution, that we have retained in France such a great number of those works, in spite of the destructions first undertaken by the monarchy after the 16<sup>th</sup> century, during the revolution of the last (18<sup>th</sup>) century, and finally by the communes since that epoch.

Note 1.p.367. Art. Pont, Fig. 4.

Note 2.p.367. See Des plus excellens bastimens de France, by Du Serceau.

Note 1.p.368. Olivier de Clisson was named by his contemporaries the Butcher.

Before passing to the examination of posterns, we must say some words on the gates of barbicans, i.e., belonging to great advanced works, gates that present particular arrangements.

It was only in the 13<sup>th</sup> century that men began building barbicans of masonry. Until then these advanced works, intended to facilitate the sorties of numerous troops or to allow retreats, were generally built of wood, and consisted only of terraces with ditches and palisades. But the besiegers by setting fire to these works made their defense impossible; they they adopted the system of constructing barbicans of masonry, outside important places, and strengthening them by towers if necessary. Yet men always sought to open these defenses at the side opposite the ramparts forming the body of that place, so as to prevent the besiegers lodged there from maintaining themselves there. The galleries of the barbicans are conceived according to these principles, and the defenses composing them are open at the gorge (rear).

About the end of his reign, the king Louis IX caused the restoration of the external walls and the repair of the castle of the city of Carcassonne. At the side of the city, he caused the construction of a barbican of semicircular plan, which defended the approach to the gate of the castle, a gate already given in Figs. 3, 4, 5, 6.<sup>1</sup> The barbican of the castle of Carcassonne in form of a half moon, opens on the streets of the city by a gate of simple and well understood construction; t





and that gate not projecting from the face of the circular wall forming the barbican, is opened entirely in the interior, so that the defenders of the entrance of the castle can completely see those of the gate of the barbican, and even give them orders. If the besiegers obtained possession of this first entrance, it was easy to cover them with projectiles.

Note 1.p.369. For the plan of this barbican, see Fig. 11 at E. (*Art. Architecture Militaire*).

Here, Fig. 40 at A, is the plan of this gate at the level of the ground, the exterior of the barbican being at B. A machicolation C defends the folding doors closing at D. At E is the entrance to the stairs in the open, that ascend to the upperstory; at F is a closet intended to receive the torches and other equipment necessary for the service. The plan G is taken at the upper crenelated story, that is reached by the stairs I and the steps J. The defensive galleries K of the circular curtain are placed 3.3 ft. below the floor L. One sees at M the opening of the machicolation that protects the folding doors. Lateral battlements enfilade the defensive galleries, and are isolated from the defensive story of the work by two doors O. That upper story, like the entrance to the ground story, is commanded by the defense of the gate of the castle.

Fig. 41. presents the external elevation of this gate, and Fig. 42 is its section made on its axis. The appearance of the work from the interior of the barbican is reproduced in the perspective view, Fig. 43. It is easy to recognize in examining this last Fig., that the upper defenses, like the entrance, are open at the side next the castle, and that it was therefore difficult for a besieger to maintain himself there opposite to the great defense, that protected the gate that we have given. Figs. 3, 4, 5.

But quite generally the gates of barbicans opened laterally in reentrant angles, so as to be well covered by projections, and then they were only openings not defended by themselves.<sup>1</sup> These barbicans about the beginning of the 14 th century assumed a greater importance from the point of view of the defense; they were furnished with towers, as we have shown above, when occupying ourselves with gate S. Lazare of Avignon; they took the name of forts, bastiles, ramparts, and their gates, while commanded by internal works, were often flanked by little towers





or turrets. Such defended the gate of two mills at Rochelle, situated behind the tower of the lighthouse;<sup>2</sup> those of S. Jean d'Angely; of S. Jacques at Paris; of Orleans, etc.

Note 1.p.341.Art. Barbocone, Figs. 2, 3.

Note 2.p.371.See Topographie de la Goule, Merion.

Among those gates preceded by forts, one of the most remarkable was that of the castle of Marcoussis, that dated from the end of the 14 th century, and whose destruction is so regretted. There the defensive system was complete. The front gate opened at the side of a square fort defended by two towers. From the fort the communication of the entrance of the fortress was by a fixed wooden bridge, then over a wide ditch filled with water, and a drawbridge. This entrance was flanked by two great towers, then rose beyond the corner tower, surmounted by a very high turret, that permitted seeing all that passed in the fort and outside. The gate of the castle and its defensive works absolutely commanded the fort at a very small distance.<sup>1</sup>

Note 1.p.373. See Topographie de la Goule. Merion.

#### PORTES DE DONJONS. POTERNES. Doors of Keeps. Posterns.

The keeps possessed doors defended in quite a particular fashion. These doors were often raised above the level of the external soil so as to place them under protection from a direct attack; wooden ladders were then arranged by the garrison so as to be able to enter these forts or to leave them. But it is understood that this arrangement presented serious inconveniences. If the defenders of the castle or city were compelled to take refuge hastily in the keep, this means of access was insufficient, and it occurred (as that presented itself during the last phase of the siege of castle Gaillard by Philip August),<sup>2</sup> that the defenders taken at a disadvantage, had no time to enter the keep. Then they sought to render the doors of keeps as difficult as possible to force, while leaving to the besieged the means of taking refuge in an isolated mass in the last defense, if they were pressed too closely. Many keeps had two posterns, one visible and the other subterranean, and communicating with the exterior, so that if a garrison thought it could no longer hold out in the place, either from the vigor of the attack or lack of provisions, it could escape and





leave to the assailants only an empty fortress. The great great Norman keeps on square plans were generally so arranged.<sup>3</sup> But still, once that the garrison was shut within their walls, it became very difficult to leave before a prudent enemy, either to escape or to attempt offensive sorties, for the subterranean posterns were not so secret, that the besieger could have no knowledge of them, and the doors elevated above the ground outside were difficult to pass in presence of the besieger. Those problems seem to have occupied the constructor of the admirable keep of Coucy. That keep possesses a door pierced at the level of the counterscarp of the ditch excavated between the tower and its curtain, and a little postern elevated to the level of the defensive gallery of that curtain, which by a stairs is put in communication with a postern opening to the exterior of the place.<sup>4</sup> The door of the keep of Coucy is pierced in the ground story, and is arranged with minute care; it allows the garrison either to cross rapidly that ditch, to descend to the stone pavement forming its bottom, and to reach the external postern, or to protect a body of soldiers very closely pressed by the assailants; further, contrary to the customs of the time, this doorway is very richly decorated by sculptures in a beautiful style.

Note 2.p.373. Art. Chateau.

Note 3.p.373. Art. Donjon.

Note 4.p.373. Art. Chateau.

Fig. 44 gives at A the plan of that doorway, and at B is its longitudinal section. It is closed (see the section) by means of a drawbridge, a portcullis, folding doors with bars sliding into the thickness of the masonry,<sup>1</sup> and a second pair of folding doors, also barred. The drawbridge was raised by means of the windlass C placed in a room reserved over the passage, a room reached by the only stairs of the keep.<sup>2</sup> This windlass was so arranged, that one could at the same time lower the bridge and raise the portcullis, the chains of the bridge and of the portcullises coiling in opposite directions on its axle. But the arrangement of the floor of the bridge proves the care applied by the constructors to that point of the defense. The floor of the bridge proves the care applied by the constructors to that point of defense. The floor of the bridge swings on an axis, its rear end describing the circular arc b.





When it came to the horizontal plane, it was held fixed by a movable strut *c'*, that dropped into a recess made in the projecting course *e*; then its floor was on a level with a fixed wooden floor *G* that crossed the ditch, a floor whose two side timbers *H* rested on two corbels *I*. That fixed floor could itself be easily dropped, if the besieged wished to shut themselves absolutely within the keep. Indeed inclined struts *K*, whose feet entered three recesses *L* were held at top by wooden blocks *M* held by keys *N*. By dropping these keys by a device easily operated above the bridge the struts dropped, the side timbers were then easily operated above the removed, and all communication with the exterior was apparently interrupted. Yet if we examine the floor of the drawbridge drawn separately at *N*, we note that a part *O* of that floor is arranged like a ladder. That portion was made movable and swung in the axis *D*. By removing an iron pin shown on our Fig., the movable portion dropped and came to rest at *n* (see section). From that movable portion of the floor was suspended the end of a ladder *P*, which hung at *P'* when the floor was dropped; hence the besieged could descend into the ditch by that ladder, and these were protected by the little work *R* of masonry pierced by slots. From that recess they descended by some steps to the stone floor forming the bottom of the ditch, being able to go towards the postern of the curtain that communicates with the exterior of the place. The movable floor of the bridge being raised, the portion *O* serving as a ladder being lowered, the garrison thus found means for a sortie without any need for lowering the bridge; it then sufficed to open the inner folding doors and to raise the portcullis; which could be done without lowering the bridge by unhocking the chains from the axle of the windlass. The movable portion *O* of the bridge was raised by means of the chain *S*. The plan *A* indicates the carpentry of the drawbridge and that of the fixed floor, its side timbers being drawn at *d*. One sees that at one side at *f* there remains quite a wide space. That space is found reserved at the side where the besieger could most easily present himself at the bottom of the ditch. This was a machicolation, for with those timbers and the supporting bars *g* indicated on the section, in case of attack one could establish mantlets pierced by slots to sweep the ditch. On that side there likewise exists





below the corbels h (see plan) a stone projection that masks the underside of the bridge and the defenders descending by the ladders. At T we have drawn the transverse section of the passage made through the hoisting room and looking toward the entrance.

Note 1.p.374. Art. Barre.

Note 2.p.374. Art Donjon, Fig. 35.

Fig. 45 completes that description; it gives the elevation of the doorway of the keep of Coucy, with all existing traces of the mechanism of the drawbridge. One sees at a the three recesses receiving the feet of the struts; at b the little defended terrace descending to the bottom of the ditch; at c is the gain receiving the strut of the drawbridge to keep it horizontal; at d is the projection forming a guard; at e are the corbels receiving the stringers of the fixed bridge; at f the recesses for the supporting bars; at g are the pulleys for directing the chains of the drawbridge. The stone pavement of the bottom of the ditch is at h. At l is traced the section of the drawbridge with its movable part at i serving as a ladder.

The tympanum of the doorway is decorated by a relief representing the lord of Coucy fighting a lion, according to the legend. Personages in civil costume decorate the first arch, leafy crockets the second. One notes that of the two supporting bars f', that the bar f' alone is placed vertically over the isolated stringer of the floor and leave a machicolation open; it is because this supporting bar being placed at the attackable side, is found combined with the stringer by a wooden man let pierced by slots, as we have stated. For the same reason on this side the projection d being intended to prevent arrows that might be shot obliquely by the besiegers, f from striking after rebounding, the defenders descending the ladder to the bottom of the ditch.

All is thus foreseen with rare subtlety in this work; but it must be recognized that the keep of Coucy is an incomparable work, conceived and executed by men that seem to belong to a superior race. In this fortress the most delicate art and the most beautiful sculpture find themselves united to the foreseeing strength of the warrior, as if to prove to us that the expression of the useful loses nothing in taking into account the beauty of form, and that a military work is not





less strong, because the engineer that erected it was an artist and a man of taste. Beside that truly masterly work most doorways and keeps are but exits of little importance. Their closures consist of portcullises or drawbridges, or of simple folding doors protected by a machicolation. Still we must mention the narrow doorways furnished with a drawbridge with a single timber, and that are seen in the military works of the 14<sup>th</sup> and 15<sup>th</sup> centuries.

Here (Fig. 46) is the most general arrangement of these doorways.

They consist of an opening 3.3 ft. in width at most and 6.6 to 8.2 ft. in height surmounted by a recess destined to receive the single timber supporting a movable footbridge. At A is presented the external elevation of the doorway; at B its section; at C its plan. The single timber D suspending the footbridge is pivoted on the axle a, and being raised fits in the slot E. Then the floor G enters the recess g and closes the entrance. This floor is suspended by a chain to which is attached an iron arc K, which receives two other chains L, that support the end of the footbridge m. The timber D being raised, the iron arc lodges in l, and the chains being inclined backward force the floor to enter the recess; almost always a portcullis closes the rear end of the passage of the doorway, as our Fig. indicates. We have given some examples of gates of cities, that possess beside the carriage gate one of these posterns with drawbridges, moved by a single arm (Figs. 34, 35). When it is necessary to cause a patrol to go out or return or a single person at night, the footbridge of the postern is lowered; thus is avoided the working of the great drawbridge, and one does not have to fear surprises. Sometimes for entrances of keeps, the footbridge consists of a ladder, that is lowered to the ground, and then the chain is moved by a windlass and an arm.

But there is a series of posterns of strong places that present a very special arrangement. When these places contain a numerous garrison, it is necessary to be able to supply them rapidly, not only with projectiles, arms and machines, but also with provisions. Now if one considers that most of these places are located on precipices, that access to them was difficult for anyone; that entrances were narrow and few; that

[illegible]



in time of war the abundance of wagons and men outside became a danger; that the guards of the gates must then carefully survey those arriving; that sometimes men obtained possession of cities and castles by concealing armed men in wagons and obstructing the passages of the gates, one will understand why the supplying was done from the outside without compelling the garrison to drop the drawbridge and raise the portcullises. Then those supplies were brought to the base of a curtain at a postern elevated very high above the external soil, in a particular place, well masked and flanked; they were hoisted into the fortress by means of an inclined plane, placed at that postern. There was at S. Michel-en-Mer a long incline so arranged at one side of the upper fortress opposite a sea gate. This plane of masonry ended at a postern furnished with a windlass, and thus the provisions and all burdens were introduced into the place, without its being necessary to open the principal gate. This plane was for that purpose and the supplies of the fortress were brought only by that way. The castle of Pierrefonds also possessed its postern for victualling. We have indicated its position in the plan of that castle. (Arts. Chateau, Fig. 24; Donjon, Figs. 41, 44). The castle of Pierrefonds could easily contain a garrison of 1200 men; it was then necessary to find means of supplying a considerable quantity of articles of all sorts, arms and projectiles, in a brief space of time, if as frequently occurred during the middle ages, one suddenly found himself under the necessity of placing himself on his defense. Were it necessary to introduce wagons, beasts of burden and men from the exterior into the court of the castle to complete the supplying, the embarrassment would have been extreme, the place would have been opened to everyone, and it would have been impossible during that time to prepare the defense, and to adopt measures of order necessary in such a case. The court being crowded by all those wagons, packages, animals and men, would have only presented confusion. impossible then to admit and to send out men at-arms, to arrange the posts, and particularly to conceal the means of defense. Thus one conceives why the architect of the castle combined a postern allowing the introduction of those supplies, without allowing the men inside to be obstructed or relaxed in their arrangements, and without its being

necessary to admit a wagon, not a man stands to the right  
into the place. Not only is the supply bottom of the wagon  
of Pierponts elevated 22.8 ft. above the existing level  
and the bottom of the wagon is 10 ft. above the existing level  
from the original bottom of the water at a level of 10 ft.  
corollary, by folding doors, and protected by mechanical  
(see, however, the 10 ft. above the existing level). The bottom  
is placed between a high curtain 9.8 ft. above the bottom  
as an extra level, the bottom of the water is 10 ft.  
the external wall. An inclined plane of masonry and concrete  
runs from the bottom of the water 2.8 ft. above the existing level  
to the bottom of the water 10 ft. above the existing level  
and inclined plane and the bottom of the water is 10 ft.  
others when lowered. The 10 ft. will add us to explain this  
as A is sketched the plan of the bottom, two sections  
are intended to mark the floor of the bridge when raised, the  
vertical line is the level and the level of the bottom  
as B is shown the horizontal section of the bottom. This  
section shows the plan of the bottom of the water is 10 ft.  
other side of the movable bottom of the bottom of the water  
and the plan of the bottom of the water is 10 ft.  
placed a window, a window, a window, a window, a window  
at each side of the bottom of the water, and the bottom of the water  
windows can be raised and lowered, and the bottom of the water  
load can be raised on the inclined plane. The plan of  
the two rooms are sketched to show the plan of the bottom  
as of the bottom of the bottom. When the bottom of the water  
only is finished, the bottom of the water is 10 ft. above  
bottoms are closed, and the bottom of the water is 10 ft.  
where the bottom is reserved in the bottom, and the bottom  
bars are in the place of the bottom of the bottom of the water  
outer face of the bottom is shown as A and the bottom of the  
as at B. In the last sketch the line for the bottom is indicated  
the bottom of the bottom. The bottom of the bottom is 10 ft.  
bottoms placed at the ends of the inclined plane as B (see B  
plan). The bottom of the bottom is 10 ft. above the existing level  
horizontal line of the inclined plane. The inclined plane of  
the bottom of the bottom is 10 ft. above the existing level  
the bottom of the bottom is 10 ft. above the existing level  
form projections and also according to the same plan as the



necessary to admit a wagon, nor a man strange to the garrison into the place. Not only is the supply postern of the castle of Pierrefonds elevated 32.8 ft. above the external road around the fortress, but it opens into a special court separated from the principal court of the castle by a gate closed by a portcullis, by folding doors, and protected by machicolations. (Arts. Chateau, Fig. 24; Donjon, Fig. 41). This supply postern is pierced through a high curtain 9.8 ft. thick. Its threshold, as we have just stated, is placed 32.8 ft. above the level of the external soil. An inclined plane of masonry and carpentry rose from the road to a height 6.6 ft. below the sill and 13.1 ft. from the curtain. Thus there remained between the top of the inclined plane and the postern a space crossed by a drawbridge when lowered. Fig. 47 will aid us to explain this work. At A is sketched the plan of the postern; two battlements are intended to mask the floor of the bridge when raised, rise vertically from the lower part of the batter of the curtain; at B is drawn the longitudinal section of the postern. This section shows at b the floor of the bridge lowered to the inclined plane c. The movable timbers of that floor are indicated at d. On the floor of the upper defensive galleries D is placed a windlass; a fireplace f, that opens under the pointed tunnel vault g, allows two ropes to pass, that from the windlass run over the guide pulley e, and thence around the load that must be raised on the inclined plane. The ends of the two ropes are attached to two pins i fixed in the surfaces of the jambs of the postern. When the operation of the supply is finished, the ropes are drawn in, the doors l of the postern are closed, and the drawbridge raised; the floor then enters the recess m reserved in the masonry, and the two timbers lie in the slots d' indicated by the dotted line; the outer face of this postern is drawn at E and its internal face at F. In the last sketch the flue for the ropes is indicated by dotted lines. From the pins i the ropes pass over two pulleys placed at the ends of the inclined plane at P (see p plan), for one will note that these pins i are fixed on the prolonged line of the inclined plane. The inclined plane of the movable floor is fitted with two long timbers, that serve for rolling the casks and cover the ropes; laterally cleats form projections and allow ascending at the same time as the





loads to prevent them from deviating. Those cleats at need facilitate the descent or ascent of a troop of men-at-arms; for this postern can also serve as a door for assistance. The inclined plane was further masked by an advanced work erected outside the road passing around the castle. (Art. Donjon, Fig. 44). The sketch G shows a portion of the floor of the bridge with its timbers and cleats. The postern was surmounted by a niche decorated by a statue of the archangel S. Michel, that we found almost entire in the excavations made at O; for of that portion there remains standing only its half. At R is given the section of the entirety of the work with its inclined plane, at the scale of 1 : 50. This entirety shows how one could unload carts and hoist casks to the level of the postern.

The supply postern of the castle of Pierrefonds is perhaps one of the most complete and most interesting among these works of defense. The simplicity in working, the rapidity of means of closing, the beauty of construction, leave nothing to be desired. The same castle possesses a low postern at the north side, that was intended for the exit and return of the patrol. This postern opens in the tunnel and was only closed by folding doors, and possesses a speaking tube built in the masonry beside the left jamb, and which corresponds to the two guardrooms, one located on the ground floor and the other on the second. (See description of the castle of Pierrefonds. One also sometimes sees posterns that open on a crooked passage, and whose exit is commanded by slots. (See the plan of the castle of Bonaguil, in Art. Chateau, Fig. 23).

But we cannot think of giving in this Article all the examples of such varied posterns. It was with this detail of fortification as with all other parts of strong places; each lord aimed to possess special means of defense, so as to oppose to the assailants unforeseen tricks, and it is to be believed, that in the long hours of leisure in the life of the castellans, they frequently thought of providing their residences with new and subtly conceived arrangements, that had not been previously adopted.

PORTES D'ABBAYES, DE MONASTERES. Gates of Abbeys and Monasteries.

It is rare that the gates of religious establishments during





the middle ages have the importance of the gates of castles from the point of view of the defense. It appears that the monks, without entirely neglecting the precautions adopted in the feudal residences (for they were feudal lords), desired to preserve for their establishments the peaceful character suited to the institution. Except in some abbeys, which like that of Mt. S. Michel-en-mer were fortresses of the first order, the entrances presented some signs of defense, but did not accumulate the formidable obstacles, that for most gates of castles are complicated and extensive works. Those gates of monasteries are not preceded by advanced works, barbicans or ramparts; they open directly to the country, sometimes even without ditches or drawbridges, and their defenses are rather a feudal symbol than a serious obstacle. The gate of the abbey of S. Leu d'Esserent, that dates from the 14<sup>th</sup> century, is constructed after these mixed principles; it is as much a farm gate as a fortified gate. We present the outside elevation (Fig. 48). This work consisted of two external buttresses, each supporting a cylindrical turret. Between the buttresses masking the curtain opens a carriage gate and a postern. Three machicolations are pierced over the wide entrance and two over the postern (see plan at a); battlements crown the whole. At B is drawn the profile of the corbellings of the turrets with their drip moulding. Fig. 49 gives the section of that gate made on a b. One easily recalls that a similar entrance cannot present a very serious obstacle to determined assailants; however this may be, this composition does not fail to be skilfully conceived and in very happy proportions. Men even erected during the 13<sup>th</sup> and 14<sup>th</sup> centuries gates of monasteries, that nowise had the defensive character; then these gates were rather hospitable, i.e., were preceded by a porch, like the entrance of a church; such was the pretty gate of the abbey of Troarn, today transferred to the property of Marquis de Bonneville.<sup>1</sup> There still exists a very pretty fortified monastery gate at S. Jean-au-Bois (forest of Compeigne). That entrance of limited dimensions was furnished with a drawbridge and defended by two little towers. Its construction dates from the second half of the 15<sup>th</sup> century; it is pierced by slots arranged for crossbow men. We give (Fig. 50) its plan in the ground story a A, the external elevation





at B, and the longitudinal section at c. The postern is no more than 1.64 ft. wide and was furnished with a drawbridge with a single lever. The floors of the two drawbridges shut into rebates and were protected by machicolations. The towns alone were covered, the back of the gate only presenting a defensive gallery like that of the curtains; the construction is of stone or rubble masonry. The arch preceding the gate passes over a ditch 39.4 ft. wide and dates from the same epoch. It is composed of two arches, the narrower one next the drawbridge being to diminish the thrust on the last pier.

Note 1.p.388. See the description of this gate in Bull. mon. Vol. IX.p.300.

We fear to weary our readers by adding other examples to those already very numerous ones, that we have given relating to fortified gates; but this detail of military architecture of the middle ages is of such great importance, that we must at least collect the most remarkable examples. We are far from having exhausted this subject, and there would have to be made on the fortified gates of the 11 th to the 15 th centuries an entire work. We have not mentioned the gates now entirely destroyed, but of whose arrangement there remain precious documents. For example, such are the gates of Troyes, Sens and of Paris. Among the city gates still standing, and that merit being studied, we shall cite those of Provins, Moret, Chartres, Gallardon, Dinan and Vezelay, which although of moderate importance, are no less remarkable works. The ruins of our feudal castles of the middle ages also present fine specimens of gates,<sup>2</sup> and until the end of the 16 th century, the arrangements adopted during the middle ages are retained in this kind of works.

Note 2.p.388. In his excellent work on Architecture militaire de la Guyenne, M. Leo Drouyn has presented a very great number of examples of those gates.

#### POSTES EXTERIEURES D'EGLISES. External portals of Churches.

It is unnecessary to distinguish the principal portals of churches from secondary doorways. The principal portals are generally placed on the axis of the central nave are wide, relatively decorated with care and often present by the sculpture that covers their tympanums, their voussours and jambs, a series of religious scenes, are like the preface of the m





monument. We possess no church portals of importance before the beginning of the 12th century, from the point of view of sculpture. Those that still exist, and which date from an earlier epoch, are of very simple form, and do not appear to have been decorated only by mouldings with tympanums imbricated or covered by paintings. We shall have occasion to speak of those portals of the 11th century, remarkable rather for their construction than their ornamentation. When it concerns religious architecture, it is always necessary to refer to the order of Cluny, if one desires to find the elements of a complete art, formed and freed from experiments, foreign to the coarse imitations of antique Roman architecture.

The principal portal of the great abbey of Cluny, of which only some engravings remain, only dates from the middle of the 12th century, while that of the abbey of Vezelay was erected after the first years of the century. As a comparison, this is certainly one of the most remarkable and most singular works of the middle ages, at the moment when artists abandoned antique Gallo-Roman traditions, mixed with Byzantine influences, to seek new elements. We then believe it necessary to present this work in the first line, for it evidently served as type for a very great number of compositions of the 12th century in Burgundy, upper Champagne and a part of Lyonnais. Fig. 54 gives the entirety of this portal now placed at the back of the deep closed porch,<sup>1</sup> but originally open under a narrow open portico. As indicated in the plan A, it consists of two twin openings separated by a pier and closed by two leaves swinging on hinge-pins fixed in the rebates B. The two openings are wider at their lower point so as to leave more opening available for the multitude, narrowed above by an arrangement of corbels resting on the two jambs and the central pier. Those corbels are decorated by six figures of apostles in high relief and about 4.9 ft. high. On the pilaster projecting from the pier is placed a statue of S. John the Forerunner, holding in his hands a large halo, at the middle of which is carved a lamb.<sup>2</sup> Two lintels rest on the jambs of the pier, and the figures decorating these two blocks of stone exercised for several years the sagacity of archaeologists. Indeed the subjects represented are difficult to explain. On the left lintel is seen a long series of figures all marching toward t





the pier; some represent archers (hunters), persons among which one carries a fish, another a seal filled with fruits, and several lead an ox. With his back against the pier and appearing to receive the series as a man holding a sort of halbert. On the right lintel and close to the pier are two figures larger than those decorating this lintel; one holds the keys and is evidently St. Peter; the other is a woman. These two personages are close together. Beside these two persons come completely armed warriors, and that appear to fight; then a rider bearing a shield; then a very small figure of a man clad in a floating mantle, who mounts a horse by means of a ladder; then are a man, a woman and a child, whose heads have colossal ears. The head of the child leaves its two ears like two shells, that almost entirely cover it.

Note 1.p.387. Art. Porche, Fig. 4.

Note 2.p.387. That lamb was scratched out at the end of the 18<sup>th</sup> century.

What do these reliefs signify? It is first necessary to observe that they take the place occupied in tympanums of the same epoch or nearly so (as on that of the cathedral of Autun, for example), by the scene of the last judgment, the separation of the elect from the damned. There the elect occupy the left lintel (that on the right of Christ), and the damned are on the right lintel. If one refers to the time when the principal portal of the church of the Madeleine was sculptured, one will observe that the monks of Vezelay had attained a degree of power and influence, such that there was required nearly a century of bloody struggles between these religious, the counts of Nevers, and the inhabitants of the commune of Vezelay, to reduce that exorbitant power. For the abbots of Vezelay, the most laudable action, that which must gain heaven for them, was certainly the regular payment of the rents due to the abbey, the bringing of gifts; and until the middle of the last (18<sup>th</sup>) century, although the abbey of Vezelay was secularized since the 16<sup>th</sup> century, there was still at Vezelay a festival called the Offering, and which consisted in bringing to the abbot the products of the soil, animals and poultry.

For us, the left lintel represents the elect, i.e., those bringing to the abbey the products of their hunting, fishing, and their fields. The right lintel represents the damned, or





rather those liable to condemnation. One will first note at that side the figure of S. Peter, who guards the gates of paradise, and probably that of S. Madeleine, who intercedes for the fishermen.<sup>1</sup> The persons occupying this lintel then represent the vices or the sins. The fighting warriors represent discord and war; the little man mounting a horse by the aid of a ladder is pride;<sup>2</sup> the family that seems to quarrel is anger; and finally the family with great ears, perhaps calumny. We only claim to give this explanation as a hypothesis, further derived from many other examples taken from the church of Vezelay itself. Several capitals likewise represent the personified vices. Further no archaeologist is ignorant, and on the portals of our cathedrals are frequently shown vices and the opposed virtues. We shall return to that. Above these two lintels so singularly composed is developed the grand scene of Christ in his glory surrounded by the twelve apostles, all with halos and all holding books open or closed, except S. Peter, who bears two keys. From the hands of Christ escape twelve rays that reach the heads of the apostles.

Note 1.p.389. The heads of these figures are broken; but they seem to have been turned toward the persons occupying the lintel.

Note 2.p.389. One would do well to recollect, that in many sculptures and paintings of the 12th and 13th centuries, pride is personified by a man falling from a horse.

But the difficulty of interpretation again presents itself for the subjects of the first arch. Starting with the left compartment at the bottom, two persons are seen seated, each holding an inscription on his knees.<sup>1</sup> In the next compartment above is a young man richly clothed, and a woman with a conical hat. In the third compartment men seem to dispute, one with hair disordered; and in the last compartment one notes two men with heads like dogs. On the other side of Christ the upper compartment contains persons with noses like pigs' snouts. The three others are filled with figures among whom is distinguished a group of warriors.

Note 1.p.390. The heads of these two figures are broken.

If it be necessary to give an explanation of those subjects, we should be led to believe that they represent the various peoples of the South. One knows the credit given in the middle





ages to the fables collected by Pliny, and again corrupted after him, concerning the peoples of Africa and of the hypoborean countries.

Thus on the tympanum of Vezelay, Christ is placed in the midst of the world, surrounded by the peoples of the earth.<sup>2</sup> The medallions filling the second arch, and which are 29 in number, represent the zodiac of the various occupations or labors of the year. An ornament runs on the last voussoir.

Note 2.p.390. See in Archives des monuments historiques, published under the auspices of his excellency the minister of the House of the emperor, the description of the sculptures of Vezelay given by M. Merimee.

The sculpture of the principal portal of the church of Vezelay is treated in a manner to fix the attention. Very much undercut and in high relief, the details are executed with great delicacy. One cannot mistake the grand style of these figures, the energy of the pose, and often even the beautiful harmony of the draperies. But in Art. Statuaire, we shall have occasion to emphasize the singular qualities of this Cluniac school. The mouldings are beautiful, and the ornamental sculpture has a boldness and breadth of composition, that produce a striking effect.<sup>3</sup> It must be recognized that all Romanesque portals pale beside this group, conceived in a fashion quite masterly.

Note 3.p. 390. See in Art. Architecture Religieuse, Fig. 21, the internal appearance of this portal.

All figures and ornaments of the principal portal of the Madeleine of Vezelay were enriched by black lines on a whitish monochrome tone. We have not been able to discover on these sculptures any other traces of coloring.

At Autun the principal portal of the cathedral presents an arrangement analogous to that of Vezelay, but its sculpture, although of an epoch a little more recent, does not have so powerful a character. The composition lacks amplitude and originality. At Autun this doubled arrangement of jambs and pier no longer exists; the little columns rise to the level of the lintel. The mouldings are meagre, the statuary is flat and without effect. Yet the portal of the cathedral of Autun is still a remarkable work. One can find its entirety in Art. Porche, Fig. 13.





Among the most remarkable portals of the 12 th century, it is necessary to cite also that of Moissac. This portal opens laterally in the great porch, whose plan we have gives in Art. Porche, Fig. 24. It is erected beneath a wide tunnel vault, that itself forms a front porch, and which is richly decorated by sculptures in gray marble. Its pier is covered by interlaced lions, that form an ornamentation most singular and with grand effect. The jambs are cut into broad cusps above the openings, and the lintel presents a series of circular rosettes in an excellent style.<sup>1</sup> In the tympanum is seated a grand figure of Christ blessing and crowned; around him are the four signs of the evangelists, two colossal angels, and the 24 old men of the Apocalypse. The arches are only filled with ornaments. But on the piers of the tunnel vault forming a porch are sculptured on the right of Christ the vices punished; at the left being the annunciation, visitation, adoration of the magi, and the flight into Egypt.

Note 1. p. 391. This ornamentation has been engraved and is well known to artists. It is one of the most beautiful examples of the sculpture of the middle ages, and that can be rivaled only by the works of Greek antiquity.

It would be difficult to present the most remarkable examples of the portals of the churches of the middle ages. Such a collection would carry us far beyond the limits of this work. On the contrary we must seek to restrict our subject, to give some principal types, and particularly to study the successive advances of the different schools, that ended in the masterly works of the 13 th century. There is no need for being greatly versed in the study of our old monuments, to recognize that the principal portals of the churches in France present an extraordinary variety in their arrangement and ornamentation, while conforming in construction to an invariable principle. Thus the principal portals, i.e., those having wide openings, are always composed of a discharging arch, under which is placed the lintel, and a filling, which is the tympanum. If those portals must afford access for a multitude, after the 12 th century they are divided into two openings separated by a pier. This pier receives the strikes of the two leaves and relieves the lintel at the middle of its span. There is an arrangement that belongs to our architecture of the middle ages, and that





finds no analogies in antiquity. The principal portal of the abbey church of Vezelay, that we have given (Fig. 51), is certainly one of the earliest constructions of that kind and one of the most remarkable by the double arrangement of the jambs and pier, that has permitted the reductions of the span of the lintel, while leaving the widest possible passage for the multitude in seeking examples of Byzantine architecture, that so powerfully influenced our national art in the 12<sup>th</sup> century, we do not find an example of portals with the piers and spanned by relieving arches. The influence of Byzantine art makes itself felt only in the system of an arch relieving a lintel, in the mouldings and some ornaments. One then cannot mistake that the portals of Vezelay, Autun and Moissac, belong to French art, if not by all details, at least by the general arrangement. Once adopted, that arrangement must appear good, for it did not cease to be accepted till the end of the 15<sup>th</sup> century. During the second period of the middle ages, one indeed finds that only a few of the principal portals do not have their central pier serving to receive the leaves and thus offering two openings, like the gates of antiquity, one for those coming and the other for those leaving. These piers were often removed in the last (18<sup>th</sup>) century, it is true, to give passage to those platforms covered by tapestry, that then served for processions; but those acts of vandalism happily were quite rarely committed.

The principle being adopted, the architects knew how to derive quickly from it all possible benefit. The relieving arches necessary to relieve the lintel were decorated by mouldings and ornaments, and soon by figures that participated in the scene represented on the tympanum. Since it concerned the opening of those portals under very heavy and high gable walls, the number of arches was increased as the monuments became larger. Hence arches with 4, 5, 6 or 8 rows of voussoirs, that one sees curve around the tympanums of our cathedrals. The portals then form deep recesses very favorable for the exit of the multitude, for one will note that these relieving arches and voussoirs are superposed by corbelling, and that the jambs supporting them enlarge as much from the interior outward. There is still in that arrangement an innovation beyond the antique architecture of Greece and Rome.





Also at Vezelay we have seen adopted statuary in the arches. On the principal portal of that church the attempt is still timid. The first row of voussoirs decorated by subjects forms a part of the tympanum, so to speak. But already at Avallon, the church of S. Lazare, which dates from the middle of the 12 th century, presents arches, each voussoir of which is decorated by a sculptured figure. From that epoch, this system of ornamentation is accepted, as one can recognize by examining the portals of the abbey church of S. Denis, the western ones of the cathedral of Chartres, and finally the portal S. Marcel of the cathedral of Paris, whose fragments were carefully utilized at the beginning of the 13 th century in the construction of the existing facade. In that respect it is well to mention this very common fact of the use of the fragments of portals of the 12 th century during the 13 th. Indeed, the 12 th century with an art so elevated and powerful, knew how to compose portals of great beauty, both in harmony of proportions and in details of sculpture. The architects of the 13 th century, such bold innovators as they were, generally so careless concerning the works of their predecessors, appear to have been seized by scruples, when this concerned the disappearance of certain portals erected during the preceding century. Thus not only on the western facade of the cathedral of Paris, the architect skilfully replaced the tympanum, a lintel and the greater part of the arches and the statues of the jambs of a portal very probably belonging to the church rebuilt by Etienne de Garlande in the 12 th century; but at the cathedral of Chartres we see replaced under the facade of the 13 th century the three portals, that formerly opened behind the two towers and under a porch; that at Bourges the architect used again important fragments under the north and south porches, of the two transept portals of the church of the 12 th century; that at the cathedral of Rouen were retained on the western facade in the 16 th century two portals of the 12 th. Those works of art had then acquired a celebrity sufficiently established that one dared not destroy them at the time, when they did not scruple to cast down earlier structures, especially when this concerned cathedrals. Later, one can find the same spirit of conservation and the same respect, when it refers to portals of the 13 th century. Some of those works seem





sufficiently beautiful to be allowed to remain among more recent constructions. Under the porch of S. Germain l'Auxerrois at Paris, one sees that the architects have retained a portal of the 13 th century, although they entirely rebuilt the facade in the 15 th. At S Thibaut, the very beautiful portal of the 13 th century remains enclosed among constructions of the 14 th. At Sens, the constructors that rebuilt the facade at the beginning of the 14 th century retained the principal portal dating from the end of the 12 th. At the abbey church of S. Denis, the north portal of the transept of Suger is left in the midst of rebuildings of the 13 th. At Auxerre, portals dating from the middle of the 13 th century remain engaged in constructions rebuilt on the facade in the 15 th. And indeed, the architects of the 14 th and 15 th centuries, in spite of their knowledge, the profusion of their ornamentation, their seeking for effects, could not attain that breadth of composition, that beautiful harmony of statuary combined with architecture, that were the dominant qualities of the artists of the 12 th and 13 th centuries. They rendered justice in preserving those fragments, that most probably passed for masterpieces.

In occupying ourselves first of all with the portal of the abbey church of Vezelay, we desired to give one of those examples as a starting point, which is an innovation and event of considerable influence; but the principal schools of France from the beginning of the 12 th century had adopted for the portals of churches as for the other architectural parts, types very different from each other, although subject to the common principle of arches and lintels indicated above. Auvergne, Nivernais and a part of Berry; Ile-de-France, Champagne, Picardy, Normandy, Poitou and Saintonge, Languedoc, Burgundy, thus present eight distinct types, that in the 13 th century are combined in the Gothic unity. We do not pretend to establish, that those provinces each erected church portals according to an accepted and invariable model; we state only that one finds in each of those schools similarities in the proportions, in the decorations, in the construction; for example, that it is impossible to confuse a Romanesque portal of Champagne with a portal of the same epoch belonging to a religious monument of Auvergne or of Poitou. In Auvergne and Niver-





Nivernais, in that Romanesque school so advanced from the beginning of the 12 th century, we find examples of portals, the more remarkable by the manner in which they are composed and jointed.

The principal portal of church S. Etienne of Nevers is one of the freest examples of the school of the central provinces and one of the oldest. This portal dates from the last years of the 11 th century. It was entirely painted. The voussoirs were jointed in a remarkable fashion, and were likewise covered by paintings representing birds facing each other, and ornaments on a black ground. We give (Fig. 52) the plan and elevation of that portal. The lintel and tympanum have disappeared; they were very probably decorated only by paintings. One must mention as belonging to that school the relatively slender proportion of the opening; the unusual size of the two first columns that recall the Gallo-Roman examples; and finally that jointing of the voussoirs, which is caused by the necessity of employing very small materials.

Yet the columns are monolithic and are cut in the lathe according to a custom adopted in the central provinces during the 11 th and 12 th centuries; the capitals are also turned, except the abacuses, which are rectangular and are made of another course of stone. At A is sketched the section of the archivolt. This Romanesque art of Auvergne and of Nivernais, already delicate toward the end of the 11 th century, well studied in the proportions and profiles, must promptly produce remarkable results; indeed from the middle of the 12 th century in the same city of Nevers was erected the portal of the church of S. Genest, that can be regarded as a masterpiece by its good proportion, the beauty and earnestness of its sculpture. That doorway (Fig. 53) has but 6.6 ft. of opening, and no more than the preceding possesses any central pier. The two leaves strike on each other.<sup>1</sup> On the lintel are carved the 12 apostles standing,<sup>2</sup> and in the tympanum, Christ is surrounded by the four signs of the evangelists. The rounds of the archivolts are ornamented by delicate sculptures, that do not destroy the mass of the profile, and the four capitals are finely wrought. The drawing of that doorway was produced by means of two equilateral triangles, as indicated by the elevation A. The lower equilateral triangle is inscribed from





the three points a, b, c; the upper equilateral triangle, between the inner beginning of the rounds of the second archivolt and its summit.

Note 1.p.393. This doorway, enclosed today within private property, has lost its tympanum, of which in 1845 there existed some fragments in a neighboring garden.

Note 2.p.393. Except a single one, these statuettes are mutilated.

The pointed arch is drawn, the centres being much raised and set on the points dividing the diameter of the first archivolt into three equal parts. That arrangement has given a very happy proportion and entirely satisfactory curves. Evidently there are studied and sought combinations. One will note also that as construction, this doorway is wisely conceived; the lintels and tympanums being left independent of the archivolts, and supported only by the two corbels and the jambs. One of those corbels at the right is decorated by foliage, the one at the left being simply moulded.

It is well to emphasize by several examples the character peculiar to some of the schools just mentioned. Portals in the religious and civil edifices, being the part treated with very particular attention, they are impressed by the style adopted in each of those schools. If we transport ourselves into Picardy, a province in which the monuments of the Romanesque epoch have become rare because of the inferior quality of the materials, we shall still find some portals from the beginning of the 12<sup>th</sup> century, that are built on a model very different from those of Ile-de-France, Normandy, and of the provinces of the Centre and the West.

Here (Fig. 54) is the entirety and details of a doorway opening laterally into the nave of the church of Namps-au-Val in the suburbs of Amiens. It approaches the Roman-Greek style of the monuments of the vicinity, and it would be very strange if the architect who built that doorway had not seen, or at least received sketches of those edifices of the 5<sup>th</sup> century. The mouldings, the ornaments of the tympanum, the volute endings of the external archivolt, are reminiscences of the Roman-Greek architecture of Syria, that the first crusaders found in their passage. This opening is richly surrounded by mouldings inside. The mouldings of the archivolt and the lintel g





given at A at the scale of 1 : 10, are very beautiful, and have nothing more of the rudeness of Romanesque mouldings copied from Gallo-Roman edifices. But this doorway resembles in no fashion, neither in proportions nor in its style that of the church of S. Etienne of Nevers, which dates from nearly the same epoch.<sup>1</sup>

Note 1.p.397. M. Hossenet, architect at Amiens, has drawn for us that doorway with the greatest care. The Romanesque windows of this church are impressed by the same round arched character, and are ornamented by that terminal volute at the base of the archivolts, so common in the Roman-Greek monuments collected in Syria by count de Voûge and M. Dutroît.

If we pass into Beauvoisis, we see some doorways of churches of the beginning of the 12 th century, that assume an entirely different character. Let us select among others that of the church of Villars S. Paul (Fig. 55). Here are no longer the slender proportions adopted in the preceding examples. The splays are deep, supporting high archivolts decorated by chevrons and frets. A squat gable covers the portal. The ornamental sculpture is of very beautiful character, although a trifle wild. The sculpture of the figures is of an entirely primitive rudeness, and recalls Gaulish coins. These figures are scarcely indicated other than in a little square relief set below the apex of the gable, which represents Samson conquering the lion. One will note the singular jointing of the lintel, that is explained by the difficulty of raising a great block of stone on the jambs, the entire construction being erected with materials of small dimensions. At A we give one jamb in plan, at B being a section of the archivolt.

The style of this doorway more nearly approaches the style adopted in Normandy and Poitou than any other, but still it is heavier and more massive. The mouldings are less studied and the cutting is ruder. It is evident that the architects and authors of these works belonging to edifices so near Paris were not subject to the influences, that had acted so strongly on the artists of Picardy, Auvergne, Berry, Burgundy and the South. Direct oriental influences had not penetrated into Ile-de-France, Beauvoisis and Normandy. The artists of those provinces remained under the power of Gallo-Roman traditions and articles sent from Constantinople or Venice, such as certain





furniture and jewels, utensils and fabrics. Net in the midst of that school of Ile-de-France and of the banks of the Oise, that the architectura called Gothic was born at the middle of the 12 th century, and developed with prodigious rapidity. Which tends again to prove that the crusades were for something in that flight of art peculiar to the lay French school at about the middle of the 12 th century, and that on the other hand, if the crusades had an influence on the art of architecture among us, that this was only on certain Romanesque schools, particularly those of Burgundy, Berry, Lyonnais, the southern and western provinces.

The example that we have given in Fig. 52, taken from the principal doorway of the church S. Etienne of Nevers, although it belongs to the provinces of the Centre and nowise of Burgundy, still differs from the types adopted at the same time in Auvergne. A side doorway of the church of Notre Dame at Clermont supplies us with the very characteristic specimen of these openings of churches in Auvergne. Fig. 56 gives the external elevation of this doorway. The opening is rectangular with sharp angles and without splays. A lintel in one piece is reinforced at its centre, and supports a tympanum and is relieved by a round arch. In this example is a trace of an evident antique tradition. Two figures with arms raised as if to support a projecting impost, receive the arch and the lintel, very frankly accented. This lintel is decorated by a relief representing the adoration of images and the baptism of Jesus. The tympanum represents Christ in his glory and blessing, with two seraphim. At the sides of the archivolt two groups represent the annunciation, and probably the birth of Christ (the last relief being very much changed).

At one side of the cathedral of Puy-en-Velay exists a doorway similar to this construction, but whose relieving arch is already pointed. These doorways date from the first years of the 12 th, perhaps from the end of the 11 th centuries.

During the first half of the 12 th century were erected in Saintonge of Angoumois a prodigious number of churches remarkable for their style and the beauty of their construction. The principal doorways of those churches are all conceived according to nearly a uniform type. They are low, generally without lintel and tympanum, and their round archivolts are





very richly decorated by ornaments mostly borrowed from the oriental style of Syria. Here is one of those doorways opening into the nave of the church of Chateau-Neuf (Fig. 57). On the first archivolt are carved in low relief and much undercut, according to the method of the school of Saintonge, at the crown a lamb in a halo, angels and the four signs of the evangelists; on the second archivolt are fanciful animals in the midst of very complicated and delicate interlacings; on the third are leaves in form of palms, enclosing a round under their stems. The extreme band is decorated by foliage, interlacing recurved. Interlacings with animals cover the impost and capitals.<sup>1</sup> The leaves of the door strike inside against the archivolt, and consequently open up to the top of the arch. A little later the ornaments of these archivolts consist of billets, disks and sawteeth running along very delicately profiled mouldings. Thus the ornamented doorways of the churches of Surgères, Jonzac, etc.

Note 1.p.401. This church has been skilfully restored recently by M. Abadie.

The doorways of the church of S. Groix at Bordeaux, of the great church of Domes at Saintes, have the most perfect analogy to that given below (Fig. 57). The influence of this style extends even into Poitou, as one can recognize by examining the doorways of Notre D.me la Grande at Poitiers. But in that province as in upper Marne, from the beginning of the 12 th century, sometimes appear archivolts with voussours, each presenting a rounded boss like those seen on the south portal of the church of the Holy Sepulchre at Jerusalem. That would again be proof of the reconstruction of a great part of the church of the Holy Sepulchre by the crusaders, of count de V. Vogue had not sufficiently indicated the dates of that reconstruction.<sup>1</sup>

Note 1.p.402. See *Les églises de la Terre Sainte*, by count de Vogue. 1880.

Although much ornamented by sculptures, the doorways of Saintonge, Angoumois and Poitou are heavy in proportions, and do not have the elegance of the provinces of the Centre. Their ornamentation is confused and never presents the broad harmony of effect, so well expressed in the composition of the doorways of Burgundy, upper Champagne and Lyonnais. Yet about





the middle of the 12 th century one sees in a part of the provinces of the West a delicate study of proportions and an effect developed, when it concerns the composition of facades, and notably of the doorways. The church of S. Peter of Melle supplies us with an excellent example of the progress made by the last Romanesque architects.

That doorway is recommended rather by the manner in which it is composed than by its dimensions, since the opening is but 5.8 ft. wide. It appears that the architect desired to break with the accepted traditions. First the archivolts are pointed without any ornament. In order to facilitate exit the jambs are recessed from the arches and bear these by means of corbels ornamented by sculpture. A sculptured band serves as the last archivolt. There is here neither sculptured tympanum nor lintel, according to the custom of the western provinces, but over a very rich cornice is placed a niche containing the statue of Christ in his glory and those of the Holy Virgin and S. John. Between the corbels supporting the intermediate cornice, in a sort of metopes are sculptured some signs of the zodiac and a hog, that according to a custom very very common in the 12 th century represents one month of the year, that during which that domestic animal is slaughtered. It is unnecessary to emphasize the beautiful harmony of this composition, that our engraving permits to be appreciated. The manner in which the sculpture is arranged, the divisions of the principal parts, the contrast happily made between the plain and decorated surfaces, show well that the architect of this work understood his art. Further, the sculpture is very delicate and is executed with minute care. This was the last expression of the Romanesque art of the provinces of the West, that was extinguished some years later under the influence of the lay school of Ile-de-France.

We have already seen by the example taken from the church of Notre Dame-du-Port at Clermont, that the doorways were decorated in certain provinces by accessory reliefs, that were like slabs beside or over the archivolts. Perhaps that custom was only a very old tradition. When during the primitive Carolingian period the art of the statuary was completely lost, men sometimes collected the reliefs from antique Gallo-Roman monuments, and attached them to the new structures, notably





over the doorways, as if being the part of the edifice that they held to decorating. Later Romanesque artists retained that arrangement by overlaying new reliefs, as had been done for antique fragments. Indeed in the provinces where Gallo-Roman remains were abundant, one sees this system of ornamentation persist until during the 12<sup>th</sup> century. The great southern doorway of the S. Sernin at Toulouse furnishes us with a very remarkable example of this kind of decoration (Fig. 59). This doorway is perfectly preserved up to the cornice,<sup>1</sup> and consists of three rows of archivolts surrounding a lintel and a tympanum of gray marble. This tympanum represents the ascension of Christ according to the Byzantine system. Two angels support the Saviour, whose arms are raised toward heaven. Four figures of angels preside over that scene, two at the right and two at the left. The 12 apostles are sculptured on the lintel and turn their heads toward Christ. Two angels close that series at right and left. At the right of the arch is inserted the statue of S. Peter crushing beneath his feet Simon the magician, accompanied by two demons. On the left is the statue of S. Paul preaching. Two little figures over his head appear to listen. Beneath his feet are placed two dragons, then two other figures seated on lions. Of the four columns set in the jambs, two are of marble; these are nearest the jambs. The capitals, bands, and the corbels supporting the lintel and the cornice, are very delicately sculptured and in a remarkable style. But we shall speak further of that school of sculpture of Toulouse,<sup>1</sup> so brilliant in the 12<sup>th</sup> century, and which was abruptly extinguished during the crusades against the Albigenses, to not reappear with any splendor until about the end of the 12<sup>th</sup> century.

Note 1.p.403. The crowning traced in our Fig. is a restoration.

Note 1.p.406. See Art. Statuaire.

The examples that we have just given of the doorways of churches belonging to some ones of the principal Romanesque Schools of France, whether provided with lintels or not, all start from the same principle of construction, simple and rational, that requires explanation.

A thickness of wall being given, when the architects of the 12<sup>th</sup> century desired to open therein a principal doorway, the internal recess and the thickness of the tympanum behind reserved, there remained a certain thickness of the wall, by which





one profited to place 1, 2, 3 or 4 columns and archivolts, or even more; these columns varying from 13.0 to 6.3 ins. in diameter, he proceeded in this fashion (Fig. 60). A being the jamb, a face a was left, then taking the width B C as the base of the engaged portion, a column D was drawn. Then C B' was made equal to C B. The operation was repeated from B' to E a and from E to F as before, thus as many times as the thickness of the wall required. Thus the squares C B B' b, B' E F e gave the horizontal projections of the abacuses of the capitals under their projection.

This series of squares gave the trace of the imposts of the archivolts drawn at P; those archivolts overlapping to form a relieving arch of more or less depth. The little columns were monolithic and set on end, independent of the construction. Thus the edges of the abacuses and of the plinths of the bases exactly follow the faces of the solid masonry, and each row of voussoirs rests on the little columns. The loads being transferred to the masonry piers B C B' E F, etc., no rupture was to be feared. Later, about the end of the 12th century, when the archivolts were made lighter and were decorated by figures, men proceeded on the same principle. Only the little columns becoming more slender, the abacuses were often oblique, according to the splay, and the intervals between the little columns were hollowed as indicated by the sketch T. On these little columns were sometimes placed statues surmounted by canopies in the height of the course of the capitals or the course above, the canopies being represented at g on the sketch T, and then the voussoirs of the archivolts were jointed and moulded, as shown by the sketch M, the hollows h being reserved for the figures and the little canopies that they separate. The Romanesque principle was retained, but perfected and made lighter; the columns usually remained independent, i.e., monolithic. This rule presents rather variations in the application of the principle, than exceptions, as we shall see.

However little one may have studied the different architectural styles preceding this period or those foreign to those of France, he will recognize that there was the principle of composition of composition and construction of portals a new element without precedents, and that singularly lends itself to decoration. Indeed, when it concerns the making in the great





the thick walls of facades openings sufficiently wide to facilitate the entrance and exit of the multitude, it was necessary to combine those openings in such wise, that they could without danger pierce those massive and high structures, and at the same time open widely by steps. The system of superposed archivolts forming a series of concentric rings, continuing to widen from inside to outside, was very well invented from the point of view of stability and effect. These stepped archivolts formed a wide frame around the tympanum, and it was natural, that being ornamented by reliefs, to cover these archivolts by figures forming the complement of the principal scene, an assemblage of persons participating in that scene. We have seen that this system was already adopted at Vezelay. We see it developed on the western portals of S. Lazare of Avallon, on the royal portal of the cathedral of Chartres, and on many other churches erected from 1150 to 1180. Now we are going to examine how this Romanesque principle of the 12 th century is modified to fall into the Gothic scheme in several ways.

Evidently about the second half of the 12 th century the architects sought in the composition of drawings, regarded as a very important part of religious edifices, if not new principles at least varied applications. The monotony of the composition of Romanesque doorways in each school was fatiguing; men desired to try something new yet without abandoning the first system, that appeared excellent and is so indeed. Thus for example, that on the facade of the church of the Souterraine, Surmounted by a great tower, the doorway was opened with a very original appearance, although its plan was drawn in accordance with the mode of splaying definitely adopted. This doorway (Fig. 61), like most of those of Poitou and of Saintonge, has neither lintel nor tympanum. The first archivolt set on the jambs is cut in a series of strongly emphasized cusps detached against the void of the opening; the leaves consequently open internally to the top of that toothed arch. The other arches present a series of rounds alternately circular and cusped. These cusps even descend to the level of the bases. The sole sculpture noted on this doorway is that of the capitals, and still the general appearance is very rich and with happy proportions.<sup>1</sup> One notes how the jointing of the voussoirs combines with the system of cusps. This system of jointing

was further confirmed to that adopted for all openings with  
 a similar design. The design was slightly altered but the  
 style was the same.

Note 1.0.100. The church of the Goutier in a very beau-  
 tiful style of the end of the 12th century has been restored  
 recently by M. Wodde.

It is interesting to observe that in the style of a building  
 it is the same as the style of the Goutier in the 12th century.

In the 12th century the little church of Goutier near Lisle-  
 es-Bains is a principal doorway, that dates from the 12th century  
 and is an example of the style of the 12th century. It is  
 a very fine example of the style of the 12th century. It is  
 a very fine example of the style of the 12th century. It is  
 a very fine example of the style of the 12th century. It is

original work. Between the doorway (No. 10) and the door  
 (No. 10) of the Goutier, the style of the 12th century is  
 in an interval of 10 years. Now the early doorway is in

the style of the 12th century. The doorway of Goutier is in  
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was further conformed to that adopted for all openings with archivolts. Here the arches are already pointed and the round arch has disappeared.

Note 1.p.408. The church of the Souterraine in a very beautiful style of the end of the 12 th century has been restored recently by M. Abadie.

It is interesting to observe how in the middle of a province is made the transition from the Romanesque to the Gothic style. In Ile-de-France the little church of Nesles near Isle-Adam, possesses a principal doorway, that dates from the last years of the 12 th century, consequently contemporaneous with the preceding example, and which is recommended by the purity of its style, the sobriety of its ornamentation, without there being in that work of a new appearance for that epoch any of those singularities freely admitted by artists in search of original ideas. Between this doorway (Fig. 62) and that given from the church of Villars-S.-Paul (Fig. 55), there is scarcely an interval of 60 years. Now one easily recognizes that in that province art has departed from Romanesque tradition more rapidly than elsewhere. The doorway of Villars-S.-Paul is in a heavy Romanesque style, even barbarous, if one compares it to that of the provinces of the Centre, West and South, and while in the last province the transition from Romanesque to Gothic is laboriously made, or not made at all, we see suddenly appear in Ile-de-France in a few years a delicate and sober style, breaking with the traditions of the preceding ages, taking into account the proportions and avoiding eccentricities so common at the moment of the formation of an art.

At Nesles the little columns are monoliths and independent of the structure; the drawing of the plan is entirely Romanesque, except being lighter; the architects profile it in the happiest and most logical fashion (see A). Sculpture is rare, while it is lavished on the Romanesque doorwaysof the same province, but is distributed by an artist of taste on the bands and jambs, between the little columns, as if to emphasize them. Here is evidently a reaction against the Romanesque style. It is not a modification but a complete rapture, which must rapidly bring the most beautiful results, since the western doorways of the cathedral of Paris are nearly contemporary with this, and the doorways of the cathedral of Amiens and





of Rheims were erected 30 or 40 years later.<sup>1</sup>

Note 1.p.411. The lintel and mullion of the doorway of the church of Nesles have been removed and are restored here only from the fragments. We do not know whether the tympanum contained a relief; we doubt this, considering the extreme sobriety of the sculpture of this little monument, erected by the aid of very small resources.

Before occupying ourselves with such remarkable doors as of some of our French cathedrals, we believe it necessary to make known also certain attempts made in the provinces at the time that art freed itself from Romanesque traditions.

While men erected the doorways represented in the two last examples, i.e., from 1190 to 1200, there was built near Avalon in Burgundy a very remarkable religious monument, that we have frequent occasion to mention, the little church of Montreal. Its western facade is entirely plain, only being decorated by a low and broad doorway and by a rose window. The doorway is distinguished by the singularity of its composition and its sculpture, which is of the most beautiful style. Better to cause our readers to appreciate this work, we adopt a scale that permits obtaining a more accurate idea of its character, and so we give only half the whole. (Fig. 63).

Although the walls of the church of Montreal are built of roughed rubble, the internal piers, buttresses and facade are constructed of beautiful masonry in stone from Contarnoux, the joints and beds being fine and perfectly dressed. As for the facings, they are cut with a care and precision very remarkable, and the charm of that little edifice chiefly consists in the manner in which are treated the mouldings and projections. All the straight or uniform surfaces are set tooth-axed with a straight edge, while the delicate mouldings, like bases and abacuses are polished. The contrast between those modes of cutting gives something precious to the mouldings and arrests the eye.

Our Fig. indicates the jointing, and allows one to recognize that it is entirely in accord with the form adopted. The beds coincide with the members of the mouldings, the height of the capitals, the bands, the division of the cusps ornamenting the jambs and the arrangement of the members of the archivolts. The architectural details are further treated with rare care





and by a consummate artist: the little columns of the jambs are monolithic, and between them the angles of the stepped jambs are ornamented by little flowers, two in each course. In Art. Gorge (Fig. 3) we gave the lower part of this mullion, whose composition is most original. But according to the custom of the architects of Burgundy about the end of the 12th century (for this doorway dates from 1200 at latest), the mouldings of the archivolts above the lower bed of the impost start in the midst of ornaments or of half cylinders taken out of the square of the mouldings as we have indicated at A. The mouldings of the archivolts then do not rest abruptly on the abacuses of the capitals, and retain strength at their starting. At B is drawn the section of the archivolts at the scale of 1 : 25. Each voussoir being profiled within a rectangle traced at a, in the spaces b are cut the imposts and the leaves or horizontal half cylinders. The leaves of the doorway of the church of Montreal have retained their hinges of wrought iron, which are of very delicate design.

Fig. 64 gives at A the plan of this doorway. One will note that the first little column a is recessed behind the projection of the moulding of the plinth of the base and the abacus of the capital (which have the same horizontal projection), so that this projection may not pass the face b of the wall of the facade. Hence the outer member of the archivolt rests on the facade b, and not on the abacus. All that indicates care and study, and does not allow one to suppose, as some pretend, that this architecture proceeds at hazard, that it does not know how to foresee anything. In the interior a stone gallery rises over this doorway; it is supported by great corbellings and by the little column B (Art. Tribune), placed on the steps that descend into the nave; for the external ground is higher than the internal floor beside the western facade. Two pointed relieving arches are stilted and line the lintel inside, resting on little engaged columns d and on the mullion. At C we give a perspective drawing of the capitals with their abacuses, above which are noted the imposts of the archivolts descending into the half cylinders just mentioned; for at one side of the doorway are ornaments, at the other being those half cylinders. However insufficient our sketch may be, it sufficiently shows that the sculpture is in a good style, large in scale and well





composed; that these capitals frankly bear the four members of the archivolt, and are skilfully combined with the little flowers, that decorate the angles of the jambs.

The architecture of Burgundy during the 12<sup>th</sup> and 13<sup>th</sup> centuries is recommended by breadth and boldness. The mouldings and sculpture are broadly treated; further, the compositions present a character of originality, that one does not find developed to the same degree in the other French provinces. The principal doorway of the church of the Madeleine of Vezelay and that of the church of Montreal give the measure of these particular qualities, that belong to the genius of the people established in that province. In Burgundy the architecture of the 12<sup>th</sup> and 13<sup>th</sup> centuries does not stop at the consecrated type, on the contrary it seeks variety, new and bold paths; it knows how to profit by the materials furnished by the ground, and its school of sculptors is powerful. There yet exists beneath the porch of the church of S. Pere, or rather of S. Pierre-sous-Vezelay a doorway very deteriorated today, but whose composition is impressed to a remarkable degree by the qualities just mentioned.

This doorway (Fig. 65) dates from about 1240, although of small dimensions, is evidently conceived by an artist of the first order. It was originally pierced beneath the gable whose elevation has been given (Art. Pignon, Fig. 8); the porch having been erected later. A mullion separates the two twin openings terminated by trefoils of bold design. This mullion is now deteriorated, but was decorated by a statue of S. Pierre placed very near the ground. Over the canopy that crowns this statue, and whose traces are found, is sculptured the bust of a king (probably David), which supported a seated figure of the Saviour, accompanied by two angels bearing censers.<sup>2</sup> On the jambs with backs against two columns were seen two other statues, now destroyed, and crowned by canopies of high form. At A we have drawn the plan of the doorway with the horizontal projection of the abacuses of these capitals, the canopies and the imposts of the archivolts. In this composition the statuary fills an important place; it is impressed with a free and powerful character; without opposing the lines of the architecture. This entirety is built of relatively large materials, well jointed.





Note 2.p.415. These statues of angels, the canopies and the cruciform halo of Christ still exist.

We are compelled to restrict ourselves and to leave aside a number of examples of doorways, remarkable by the variety of their composition and the beauty of their details. The examples just given in the last place, and that belong to the beautiful epoch of the middle ages, make known well that this is Gothic architecture developed in the different French provinces with a freedom of charm, very far from that hieratism of which the masters of that art have sometimes been accused. There certainly occurred a moment when Gothic architecture adopts formulas and falls into monotony; but even then are found artists, who know how to retain their individuality, while profiting by the accepted principles of the consecrated types, as we shall soon see. During the period of formation, it is always by liberty in composition and execution, that Gothic art recommends itself, although then it remains subject to definite principles. In that can the study of Gothic art be profitable.

We have seen how the school of Toulouse knew how to harmonize the traditions of Gallo-Roman architecture with the Byzantine principles gathered in the Orient. Another neighboring school, that of Provence, was still more intimately connected with the last vestiges of Greco-Roman art, fled to Syria. Examining the doorways of S. Gilles and of S. Trophime of Arles, which date from the end of the 12th century, one would believe that he sees the remains of those monuments scattered in such great number on the route from Antioch to Aleppo. In fact, that country was conquered by the crusaders in 1098 under the command of Bohemond I, son of Robert Guiscard; and until in 1268, the principality of Antioch remained in the hands of the western rulers. The Provençals were the natural intermediaries between France and the crusaders established in Syria; it is not then surprising, that from those countries so rich in Romano-Greek monuments, they brought the elements of the arts, which they practised in the West during the 13th century.

But the Provençals at home possessed numerous monuments of the Roman epoch; and becoming inspired by the style brought from the Orient, they mixed with it in strong proportion the





Roman elements scattered over their soil. Thus although the general arrangement, proportions, mouldings and ornamentation, may be almost entirely borrowed from Syria, the statuary is derived from the Gallo-Roman style with some Byzantine influences. It could not be otherwise, since the edifices of the vicinity of Antioch are entirely without statuary. The beautiful doorways of the churches of S. Trophime of Arles and of S. Gilles are covered by figures strongly impressed by Gallo-Roman traditions. Images, abandoned by the Christians of the Orient in the 5<sup>th</sup> and 6<sup>th</sup> centuries, who erected the monuments just mentioned always remained in honor in the West. Those men supplemented what was lacking in the models collected in the East by the imitation of Gallo-Roman remains, and by numerous sculptures constantly brought from Constantinople, and that ornamented the furniture, caskets, diptichs, manuscript covers of wood, ivory and goldsmith's work. Byzantium maintained a considerable commerce with the entire West during the 11<sup>th</sup> and 12<sup>th</sup> centuries, and in spite of the iconoclasts, sculpture had always been practised there to satisfy the taste of the French, Italians and Germans. It is necessary to distinguish these two elements in our monuments in Provence of the 12<sup>th</sup> century:—one derived from the architectural forms brought from the principality of Antioch, the other from Gallo-Roman traditions and from imports of objects made at Constantinople. These elements being known and appreciated, this Provencal architecture of the 12<sup>th</sup> century explains itself naturally. If one does not take into account those diverse origins, this architecture is inexplicable, because it seems to rise abruptly from the midst of barbarians, presenting the characteristics of a very advanced art, nearer decadence than the beginning. One can appreciate these characteristics by casting the eyes on Fig. 66, that gives a part of the doorway of S. Trophime of Arles. For the construction, mouldings and ornamentation, that doorway is entirely Syriac Romano-Greek; for the statuary it is Gallo-Roman with a pronounced Byzantine influence. Its iconography merits being studied. At the centre of the tympanum is Christ crowned in his glory, holding the book of the Gospels and blessing; around him are the four signs of the evangelists; beneath the first arch are two rows of adoring angels at half length. On the lintel are





sculptured the 12 apostles seated; then at the right of Christ on the jamb, Abraham receives the elect in his lap. At the same side are reproduced on a high frieze the elect clothed, the women being placed after the men; at the head of that procession are two bishops. On the frieze at the left of Christ are the naked damned connected by a chain and marching in the opposite direction, led into the midst of the flames by a demon. On the capital of the mullion is sculptured the archangel S. Michel leaning on a spear. Between the columns of the wide jambs of the doorway are four apostles and at the sides are saints of the primitive church. A bishop, probably S. Trophime is sculptured in one of those compartments. Opposite the souls are leaving the earth and are carried away by an angel and a devil. However remarkable the Provencal architecture of the 12 th century, it lacked power and could produce nothing but these curious mixtures of different imitations. From those mixtures could not rise a new art and in fact nothing did; from the beginning of the 13 th century Provencal architecture had fallen into complete decadence. It was entirely otherwise with the schools of the North, of Ile-de-France, Picardy, Burgundy and Champagne. Those schools were less attached to the imitation of the arts collected in the East, had received from them a very vague reflection, and sought in their own provinces the elements of an art; and the lay school of the end of the 12 th century, basing itself on a reasoned construction and the study of nature, rapidly passed their elder sisters of Provence and Languedoc. The doorway of S. Trophime of Arles, in spite of its merits from the point of view of composition, proportions and of the beautiful entirety of details, is evidently a monument quite near the decadence; while the doorway of the Virgin of the western portal of the cathedral of Paris, that is only some years later, is a monument impressed by a youthful freshness, in a new and powerful style, that promises a long series of works of the first order. It is because the doorway of S. Trophime is only a work taken from different sources, a skilful imitation, while the doorway of the Virgin of Notre Dame of Paris, though respecting the principles adopted, is an original work, that borrows from earlier arts only a general consecrated form.

Among so many bold judgments pronounced during a long time

on the one of the lay French school of the 12th century, the  
of which was the same, the same thing is to be seen  
and claiming to derive this from the original.  
the same as the original, the same thing is to be seen  
which was at the beginning of the 12th century, the same  
perfectly acceptable, when one compares the two forms  
names of which were known in France, in the 12th century  
of the house, French and Latin. But Gothic architecture, that  
the same of the same, the same thing is to be seen  
the same, the same thing is to be seen, the same thing is to be seen  
and influence from the same. If one considers Gothic archi-  
tecture from the point of view of construction, system of  
sections or arrangement, use of materials, tracing the walls  
and arrangement of the plans, ornamentation and statuary, it  
separates itself entirely from the principles proper to the  
and by the last Gothic architecture. But it is easy to see  
the really new elements and to accept them without critic-  
ing the old. The Gothic architecture, the Gothic architecture  
one finds traces of the original, and followed from the  
found more precisely, although it is demonstrated today, that  
the result of a new system of building Gothic forms and archi-  
ture in Gothic architecture are the same as those of the other archi-  
tecture of the same, the same thing is to be seen, the same thing is to be seen  
returned to the West after the expedition of Louis the Young  
certainly had something to do with the Gothic architecture, but  
architectural form. Not an act to pass over such great  
distance from one people to another, it is necessary for per-  
sonal influence by one people to another, the influence of  
returned and that commerce takes a regular course. Builders  
to not carry out in their hands, particularly if they have  
lost all of the force. The originality of Gothic was strong-  
ly established from the end of the 11th century in France, in  
the midst of a country literally covered by the cities still  
of the same, and could serve as a source of studies for many  
and artists; but it is not quite right to believe that a  
the character of the 12th and 13th centuries, that could a  
national character, and who themselves were, and who themselves were  
the same, the same thing is to be seen, the same thing is to be seen  
and so profoundly local as the so-called Gothic architecture.  
is passing for us as a study and a source of constant interest.



on the art of the lay French school of the 12 th century, or on Gothic art, if one prefers, the most singular is certainly that claiming to derive this Gothic art from the crusaders. The crusades had an incontestable influence on the art of the middle ages at the beginning of the 12 th century, rapid and perfectly appreciable, when one compares the Greco-Roman monuments of Syria with those erected in France, in the provinces of the South, Centre and West. But Gothic architecture, what the lay school of the North erected about the end of the 12 th century, on the contrary is the most manifest reaction against that influence from the East. If one considers Gothic architecture from the point of view of construction, system of proportions or arrangement, use of materials, tracing the mouldings, arrangement of the plans, ornamentation and statuary, it separates itself entirely from the principles brought from the East by the last Romanesque architects. But it is easy to adopt ready made judgments and to accept them without criticism, which we hear long repeated, that Gothic architecture was brought into France by the crusaders, who followed Louis the Y Young into Palestine, although it is demonstrated today, that the remains of architecture recalling Gothic forms and existing in Palestine are due just to those crusaders after becoming masters of Jerusalem. The small number of Frenchmen that returned to the West after the expedition of Louis the Young certainly had something less to consider than to bring back architectural formulas. For an art to pass over such great distances from one people to another, it is necessary for permanent establishment to have been formed, that relations are arranged and that commerce takes a regular course. Soldiers do not carry art in their baggage, particularly if they have lost all on the route. The principality of Antioch was strongly established from the end of the 11 th century in Syria, in the midst of a country literally covered by the edifices still intact today, and could serve as a centre of studies for western artists; but it is indeed quite puerile to believe that the crusaders of the 12 th and 13 th centuries, that could establish themselves nowhere, and who attempted only unfortunate expeditions, brought back to France an art so complete and so profoundly logical as the so-called Gothic architecture.

It remains for us to study the doorways of churches incont-





incontestably due to the French art of the beginning of the 13<sup>th</sup> century outside of all foreign influences. Already those given in this Article, taken from the churches of Nesles, Montreal and S. Pere, are frankly Gothic, although connected by some points to Romanesque traditions, or that they present some oddities. We now enter the royal domain, we open the 13<sup>th</sup> century, and the progress of architecture is pursued without deviation, both in the execution of these vast portals of our churches, as in the other parts of these edifices. We first take the doorway of the western facade of Notre Dame of Paris, pierced to the north side aisle, and which is known under the name of the Virgin. The doorway opposite this and opening to the southern side aisle is composed in great part of fragments taken from a doorway of the 12<sup>th</sup> century, as we have explained above. The central doorway was erected at the same time as that of the Virgin, was rebuilt shortly after for a reason unknown to us, for we discovered in the excavations fragments of a primitive tympanum comprising Christ and figures surrounding him. In fact by its style, that central portal seems to be some years later than the left doorway. That, called of the Virgin, belongs to the first construction of the great facade, and was consequently erected from 1205 to 1210. It is one of the most beautiful conceptions of the art of the middle ages, both in architecture, in ornamentation and statuary. It is entirely constructed of choice materials, lias from the hill of S. Jacques.

If one glances at the plan of the cathedral of Paris (Art. Cathedrale, Fig. 1), he will observe, that this left doorway opens beneath the tower, like that on the right, into a hall covered by cross vaults with transverse arches, so that one of those transverse arches rests on the mullion of the double opening, and that the two leaves being opened, these two openings are opposite the two side aisles.

The plan of the doorway of the Virgin (Fig. 67), then presents a special arrangement, very broadly conceived. At A, this plan gives the horizontal section at the level of the substructure decorated by an arcade. At B, at the level of the statues which surmount that substructure and which rest on a wide projection, the arrangement of the little columns that separate the statues is such, that these little columns are placed





on the axis b of the arches of the substructure, and that then the statues rest on the little lower columns c. On the great column D rests the transverse arch d that intersects the diagonal arches. At the origin the space D E was void, but crushing occurring in the column D, that space was filled by cut stone soon after the construction, as indicated by the dotted line s q, so as to unite this column and the mullion.

Fig. 68 presents the elevation of this doorway, which is entirely a poem in stone. On the plinth of the central mullion is placed the statue of the Virgin holding the Child; she crushes beneath her feet the dragon with a woman's head, whose tail is coiled around the trunk of the tree of knowledge. Adam and Eve at the two sides of the tree are tempted by the serpent. On the left side of the plinth is carved the creation of Eve, and on the right side is the angle driving our first parents out of paradise. A very rich canopy is supported by angels bearing censers and surmounts the head of the Virgin, terminating in a charming little structure covering the arch of the covenant. One would recall that the litanies give to the Virgin the title of arch of the covenant. Thus on this mullion the glorification of the mother of Christ is complete. She holds in her arms the Redeemer; according to the word of Scripture, she crushes the head of the serpent, and her divine function is symbolized by the arch of the covenant. On the lintel of the doorway, divided in two parts by the little building crowning the canopy, are sculptured at the right of the Virgin three seated prophets with veiled heads, and holding a single scroll in a meditative attitude; at the left are three crowned kings in the same pose. These six figures are the most beautiful among all those of that epoch. The presence of the prophets is explained by the announcement of the coming of the Messiah; as for the kings, they are present at the scene as ancestors of the Virgin. The heads of these personages are particularly remarkable for the expression of thoughtful intelligence, that seems to give them life.

The second lintel represents the burial of the Virgin. Two angels hold the shroud and lower the body into a rich sarcophagus. Behind the coffin is Christ blessing the body of his mother; around him are the 12 apostles with faces expressing their grief. In the upper tympanum the Virgin is seated at the





right of her Son, who places on her head a crown brought by an angel. Two other angels kneeling at the sides of the throne bear candles. In the four series of voussairs surrounding these reliefs are sculptured angels, patriarchs, the royal ancestors of the Virgin and the prophets. A band covered by magnificent ornaments terminates the arches. But as if to give more breadth to the final curve, a wide moulding in form of a recessed gable encloses it. This enclosure rests on two little columns.

Eight statues decorate the splays as indicated by our plan. (Fig. 67). See how those figures are arranged. Commencing with the jamb at the right of the Virgin, S. Denis is placed carrying his head and accompanied by two angels, then Constantine. On the splay opposite Constantine is Pope S. Sylvestre, then S. Genevieve, S. Etienne and S. John Baptist. The statues being placed on the little columns of the lower arcade, the tympanums reserved between the arches surmounting these little columns are consequently under the feet of the figures. Each of the tympanums bears a sculpture relating to the upper personage. Under Constantine are two animals, a dog and a bird, to signify the triumph of Christianity over the demon; beneath S. Denis is the executioner holding the axe; under the two angels are a lion and a monstrous bird, symbols of the powers that the angels crush beneath their feet; under S. Sylvestre is the city of Byzantium; under S. Genevieve a demon; beneath S. Etienne a Jew holding a stone; under S. John Baptist is king Herod. In the ground of the arcade below the little pointed arches are carved in very flat relief scenes also relating to the statues above. Thus under Constantine is seen a kneeling king holding a pennant at the feet of a seated woman, veiled, crowned and haloed, and holding a sceptre. That woman is the Church, to which the emperor renders homage. Beneath the angels are seen the combats of these higher spirits against the rebel spirits. Under S. Denis is his martyrdom; beneath S. Sylvestre is a Pope conversing with a crowned personage; under S. Genevieve is a woman blessed by a hand extending from a cloud receiving the aid of an angel; Under S. Etienne is the representation of his martyrdom; beneath S. John Baptist the executioner is giving the head of the precursor to the daughter of Herodias. At the same height on the jambs are sculpt-





sculptured at e the earth (see the plan) represented by a woman holding planets in her hands; at f is the sea similarly shown by a woman seated on a fish and holding a boat. The outer jambs of the doorway at h are covered by plants sculptured with rare delicacy; one perfectly recognizes an oak, beech, pear, chestnut and sweetbrier.

Thirty seven reliefs sculptured on the two sides of each jamb of the doorway at m compose an almanac of stone over the reliefs of the sea and the earth. These are the figures of the zodiac and the different labors and occupations of the year.<sup>1</sup>

Note 1. p. 423. For more ample information, see Description de Notre Dame, cathedrale de Paris, by MM. Guilhermy and Viollet-le-Duc. 1856. The eight statues of the jambs of that of the Virgin, destroyed at the end of the last (18 th) century, have been replaced recently.

The entirety of this composition, whose grandeur and character are rendered by our engraving, thus forms a complete whole. First is the Virgin in her part as woman, chosen to destroy the reign of the demon. Her genealogy and the prophets who announced her birth; her death, her coronation in heaven. Then the personages who inaugurated the Christian era, S. John Baptist, S. Etienne, the first martyr, Pope S. Sylvestre and the emperor Constantine; and to attach this summary to the diocese of Paris, S. Denis and S. Genevieve. Earth and sea, the annual revolution, are present at this divine epoch and appear to render eternal homage.

Thus the artists of the commencement of the 13 th century knew how to compose a cathedral doorway. And yet who believes what men could see in all that two centuries since? A symbol of the ground work, figures concealing the discovery of the philosopher's stone? Entire works have been written on those dreams.

The execution fully corresponds to the grandeur of the conception, and the statuary of this doorway can be placed in the rank of the most beautiful works by the artists of the West. (Art. Statuaire).

The doorway of the Virgin of the western facade of Notre Dame of Paris is certainly one of the first conceptions of this kind. Superior to the analogous works of the 13 th cent-





century, at the first stroke it attains the climax of the art. If one studies that doorway free from the influences, that pretend to class all the works of the middle ages below those of antiquity, he soon recognizes that never has the alliance of architectural and statuary been more intimate. The scale of the figures is observed with rare delicacy; a quality that is nearly always wanting in later works, and too frequently in those of antiquity. If there are differences in the dimensions of those figures, they are not sufficiently sensible that their union cannot form a complete entirety. The statues that decorate the voussours indeed are half length, so <sup>as</sup> to give them a scale corresponding to those decorating the tympanums.

That entirety was formerly covered by painting and gilding, whose traces are still visible.

The central doorway of some churches, although very beautiful, yields to the doorway of the Virgin, both in composition and in perfection of execution.

This great system is followed in all our cathedrals of the 13<sup>th</sup> century. Yet sometimes the tympanums of the doorways were pierced by openings, actual glazed windows. For example, such are arranged in the three portals of the cathedral of Rheims. This is a peculiarity that seems to belong to the school of Champagne, dating from the middle of the 13<sup>th</sup> century, but which remains as an exceptional condition. The sculptured tympanums gave the image-makers too many beautiful spaces to fill, that they should not profit by them, and in fact, no better places have been found for developing sculptured scenes. On two doorways of the western facade of Notre Dame of Paris, the central and that of the Virgin, the figures decorating the upper part of the tympanums are statues placed against a ground, like the statues that decorate the two tympanums of the facades of the Parthenon, while those of the lintels are in high relief. As for the figures of the voussours, they are each carved on a voussour before setting it. One has reason to be astonished that this epoch could furnish a number of image-makers sufficient to allow the erection of such richly adorned doorways in very little time, as the differences of working are scarcely sensible, and all figures are sculptured in stones as hard as marble, and all in remarkable style of execution. The doorway of the Virgin contains 9 great statues;





28 figures, some larger than life on the lintels and the tympanum; 62 figures on the voussours, on foot or half length, a almost natural size; further 29 reliefs, without counting the ornamentation. The central doorway, that of the last judgment, contains 13 statues over 6.6 ft. high, 5 colossal figures in the tympanum, 50 figures smaller than life on the lintels, 126 figures or little subjects on the voussours and 42 reliefs. This indeed gives a little for reflection on the power of that school of statuary of the beginning of the 13 th century; all these figures having been sculptured before setting, i.e., rapidly enough not to delay the work of the construction. If one adds to this the number of sculptures of the doorway of S. Anne, the 28 colossal statues of the kings of Judah, the 4 equally colossal statues that decorate the buttresses, and if he recalls that this portal, up to the height of the gallery of the Virgin, must have been erected in 5 years at most, he may well ask if it would be possible today to obtain a similar result. Yet that fertility was not obtained at the expense of execution or of unity of style; certainly the work of different hands can be proved, without the result of a lack of harmony in the whole. If the great doorways of the 13 th century belonging to the cathedrals of Chartres, Rheims, Amiens and Bourges, present admirable examples, yet one cannot regard them as rivaling the two doorways just cited, and notably that of the Virgin of Notre Dame of Paris. Still at the base of the southern transept of that church exists a very beautiful doorway dated 1257, and which can be classed among the best compositions of that kind. The tympanum represents the legend of S. Etienne, and the voussours are martyrs, doctors and angels. On the mullion is placed a statue of the saint, and in the splay are placed apostles. It is to be believed that this doorway passed for a masterpiece, at the time it was built, for it is found exactly copied, save some details, at the base of the southern gable of the cathedral of Meaux, but by less skilful hands.

It is also necessary for us to cite among the doorways of the middle of the 13 th century, remarkable by their execution and their composition, those of the S. Chapelle of Paris, that of the south transept of the abbey church of S. Denis, recently discovered, and which was unfortunately mutilated during the





the last (13 th) century to construct a corridor between the church and that house of religious. In sculpture that doorway is an incomparable work, and stone was never treated with more skill.

The end of the 13 th and the 14 th centuries furnish us with examples of doorways well composed and of excellent execution; but still those works are all impressed by a meagreness of style, that causes regret for the incomparable conceptions of the commencement of the 13 th century. The details and ornaments are no longer at the scale, the figures are small and the subject is confused. The general forms dominate the statuary, enclose it and reduce it to a lower part. Mouldings are multiplied, and because of seeking variety, the artists fall into monotony. Yet we should be unjust if we did not state the qualities, that distinguish some of these compositions. Many times in this work we have had occasion to cite the church of S. Urbain of Troyes, a monument of the last years of the 13 th century, whose construction and details have a great value. That church possesses a central doorway at the West, whose composition is original and graceful. The principal doorway of the church S. Urbain opens beneath a porch never finished. It is without arches, the side arch of the vault of the porch taking their places. On the middle mullion (Fig. 69) stood the statue of the Pope S. Urbain, we believe.<sup>1</sup> In a rich colonnade surmounted by canopies at right and left beneath the porch, not forming splays, must have been placed various statues, as under the porch of S. Nicaise of Rheims. Two of these statues near the jambs were more particularly detached from the group placed under the colonnade, and stood on two projecting pedestals (See plan A). The lintel was heavily charged by foliage ornaments and mouldings, representing the resurrection on a narrow band. The dead leave their coffins. In the lower compartments of the tympanum at the right of Christ, Abraham is seen receiving the elect in the folds of his mantle; at the side two angels separate the souls. Those elected are crowned. In the succeeding compartment are the damned, chained and pulled by demons; among these souls are noted a bishop and a king, recognized by the mitre and the crown, for these little figures are otherwise nude. The last compartment represents the entrance to hell under the form of a monstrous





mouth into which the demons cast the damned. Above in the two quatrefoils the Virgin and S. John kneeling implore Christ for the sinners; between them is sculptured an angel with wings spread and holding a scroll. This angel replaces the weighing of souls represented in such dramatic fashion on the preceding monuments. In the upper quatrefoil appears Christ half-nude, accompanied by two angels holding the sun and moon, and having beneath his feet the 12 apostles seated. In the two lateral triangles two angels are sounding trumpets. This is far from this little geometrical paradise, where the statuary fills a very secondary part, to the glorious tympanums of Notre Dame of Paris, Chartres, Amiens and of the cathedral of Bordeaux. This summary fashion of representing the scene of the last judgment sufficiently indicates that the great school of statuary tended already at the end of the 13th century, to leave aside the beautiful religious traditions, that had been so well interpreted by artists from 1160 to 1250.

Note 1.p.427. This statue was not set, the church never having been finished. Pope Urban IV, who was of Troyes and had supplied the funds necessary for the construction of the church, having died in 1264, the works were suspended for lack of sufficient resources about in the last years of the 13th century. There is every reason to believe, that the statue of the mullion must represent S. Urban. On many other doorways after the middle of the 13th century is seen a sacred personage and not Christ, although the lintel and tympanum represent the last judgment. Thus on the beautiful southern doorway of the abbey church of S. Denis in France, that we cited above, is seen the statue of the saint bishop of Paris on the mullion, while the lintel represented the last judgment.

At B we have sketched the plan of this mullion.

Yet by those compositions gracefully arranged, but which lack style and grandeur, that men habitually judge the art termed Gothic. Just as if one pretended to appreciate Greek art by the meagre and often mannered compositions of the time of Hadrian, instead of judging it by the monuments of the time of Pericles.

However, one cannot deny that there is in this work of the end of the 13th century, if not imagination, at least a very graceful conception, a refined study of proportions and a lav-





lavish perfection in the execution of the details; but the architecture dominates the statuary, reduced to the function of simple ornamentation. The image-maker is no longer an artist but a skilful workman.

What cannot be too much studied in the compositions of the commencement of the 13<sup>th</sup> century is the amplitude, the beautiful arrangement of the statuary. Although subject to the architectural forms, this takes its ease and develops broadly. One can prove the truth of this observation by examining our Fig. 68. In that page the statuary evidently fills the important part, but without any derangement of the architectural lines. Comparing this work (the doorway of the Virgin of the facade of Notre Dame of Paris) with the best productions of antiquity, everyone can prove that here the statuary is conceived on principles singularly favorable to its complete expansion. The idea of forming around the tympanum an enclosure of figures, an assemblage of persons present at the principal scene, is certainly very happy and novel. Nothing like it in the monuments of Greece, nor in the monuments of antique Rome.

In appreciating art matters with the eyes of an impartial critic, and not taking account of the ready made admirations imposed by an exclusive spirit, it is indeed necessary to recognize that in most conceptions of the law school of the beginning of the 13<sup>th</sup> century, the statuary is distributed according to truer principles, than it was in the monuments of antiquity. If we take the masterpiece of Grecian art, the Parthenon for example, we see that the statuary is placed in the tympanum of the pediment, in the metopes, and on friezes always in shadow beneath a portico, whose small width did not afford a sufficient distance to appreciate the value of the sculpture. The subjects placed between the triglyphs and beneath the projection of the cornice, during a part of the day, were cut by the shadow of that cornice. They are too small in scale for the place they occupy, particularly if they are compared to the statues of the tympanum.

Distant from the eye, that admirable statuary of Phidias, which can be studied and appreciated in a museum, naturally lost much. Aside from merit of execution, it is unnecessary to reason long to prove that the statuary of the portals of our great cathedrals is more favorably arranged, and that ~~our~~





Consequently the effect of the entirety produced on the spectator is more complete and more striking. To place around the doorways, i.e., around the parts of a monument, whose richness can be most frequently and easily appreciated, those myriads of figures that participate in one subject, is certainly a fruitful idea for artists called to decorate those vast portals. Then the statuary can be appreciated in its entirety as a composition, in its details as execution. It is not to distant from the spectator for him to examine it at his ease. The relations of scale between the figures are established in a fashion not to present those contrasts which are shocking in the monuments of antiquity. For example, as we have too frequently seen in the edifices of imperial Rome, one does not find figures in the round beside figures in relief, at the same scale. At the doorway of the Virgin of Notre Dame, the subjects treated in relief are very near the eye and at a very reduced scale. So to speak, they only form a diaper ornamentation, that cannot interfere with the statuary in the round.

In these compositions of the middle ages, thus there is art, much art, and if as at Notre Dame of Paris, these compositions are supported by a remarkable execution of styles, we scarcely comprehend how and why these works have been scorned so long, if not denounced as barbarous. Let us agree that the barbarians are those that do not wish to see those works under their eyes, and who on the faith of a narrow instruction, go to study afar monuments of an order very inferior to those in every respect.

The three doorways of the cathedral of Paris, like most of those erected at that epoch (from 1200 to 1220), have this in particular, that they present a very rich mass in the midst of uniform and simple surfaces. That arrangement also contributes to give more splendor and importance to those entrances. They are connected only by niches decorating the fronts of the buttresses that separate them, niches that shelter the four colossal statues of S. Etienne, the Church, Synagogue and S. Marcel. But soon this architectural system appeared too poor, though always with an assured effect. The doorways were connected into an entire architectural entirety more and more ornate; they no longer form a distinct part on the facades, but were joined to the ends of the transepts, either by projecting





portals as at Amiens, or by a general decorative system, as at Rheims, Bourges, and even at Notre Dame of Paris; like the portals of the libraries and of the calends at the cathedral of Rouen. Yet these retained their deep arches, tympanums and mullions; but the archivolts of those voussours were surmounted by gables nearly solid at first, like the north and south portals of Notre Dame of Paris, and as at the principal doorway of the cathedral of Bourges, then entirely perforated as at the cathedral of Rouen and on so many other churches of the 14th century. (Art. Gable). Thus as we have just stated in reference to the principal doorway of S. Urbain of Troyes, the statuary lost the amplitude that the artists of the commencement of the 13th century knew how to give it; the subjects of the tympanums were divided into zones more or less numerous; the figures of the voussours were sometimes busts to preserve a scale in accordance with that of the tympanum, were sculptured seated or even standing, consequently reduced in dimensions; the canopies separating the statuettes of the voussours assumed more importance, as well as the mouldings of the archivolts; the statues on the splays entered into separate niches, and no longer stood on a pronounced projection, like those of the doorway of the Virgin of Notre Dame of Paris; little columns interposed between them. These statues thus were lost in the entirety. At the end of the 14th century, the architectural forms and the ornamentation seemed to stifle the statuary. The great school wandered in the midst of a profusion of details at too small a scale: the forms became elongated and horizontal lines tended to disappear almost entirely. Yet the execution is perfect; the jointing, and the trace of the mouldings is combined with marvellous study and care.

One may note in the examples of doorways of the end of the 12th century and the beginning of the 13th previously given, that the statues decorating the splays are most frequently attached to columns bearing a capital surmounted by a canopy. Each statue thus formed a part of the architecture; it was a sort of caryatid to be set in constructing the edifice; but then the movement and the action of those figures were thus intimately associated with the entirety. Later, about the middle of the 13th century, men left in the splays of the doorways reentrant angles that permitted the placing of statues





afterwards, and when the building was constructed. This method was certainly more convenient for the statuary, as it did not compel them to hasten their work and to follow that of the constructors, but art felt this. The figures were henceforth made in the studio, perhaps at very long intervals, and no longer had that monumental unity so remarkable in the edifices of the first Gothic period. The statuary was subject to the architecture for the reliefs and all parts that it was necessary to set while building, and even decreased to allow the architectural forms to dominate more, freed itself when it was required to make great figures set afterwards. The artist lost sight of the common work, and as too frequently occurs today, devoting himself entirely to his isolated work, he brought from his studio figures that showed the individual work, and when together no longer formed that complete entirety, which alone can produce a vivid impression on the spectator.

The refinements in execution, further the very delicate observation of nature, research in details, a certain affectation in working, replaces the grand and severe style of the artist, i.e., the image-maker of the 12th and the beginning of the 13th centuries. It suffices to examine the portals of the 14th century to be convinced of the truth of this observation.

Among the great doorways of churches erected about the beginning of the 14th century, it is necessary to note among the most beautiful those of the cathedral of Rouen, the two doorways of the calends and of the library.<sup>1</sup> In spite of the profusion of details, the slenderness of the mouldings and the ornamentation, those doorways still retain well accented masses, and their proportions were studied by a consummate artist.

Note 1.p.432. This doorway was so named because opened on the side of the cloister where was installed the library of the chapter during the middle ages.

Although the dimensions of this work scarcely lends itself to render in engraving works so full of details, still we give here one of the two doorways of the cathedral of Rouen, that of the calends. This doorway (Fig. 70) comprises grand principal lines, strongly accented; they are artistically detached between the great buttresses that abut them.





On the mullion was placed the statue of Christ, now destroyed. In the splays were three apostles, three on each side; if four statues are seen on the same line on the fronts of the great buttresses on the two square returns. The two lintels of the tympanum represent the Passion. On the voussours are sculptured martyrs. In the lower lobe of the great gable is the weighing of souls. (Art. Gable). In spite of the beautiful entirety of the lines and the happy choice of proportions, one notes how in that doorway the statuary is reduced, as it has become subject to the geometrical lines. In the pedestals that support the statues are sculptured myriads of little reliefs representing scenes from the Old Testament and the prophecies. All that is further executed with rare perfection, and the statues, which do not exceed human dimensions, are true masterpieces full of grace and elegance.

The gable that surmounts this doorway is solid in its lower part up to the level A of the cornice of the gallery, but is entirely perforated above that, and permits seeing the glazed window supporting the rose window.

At B is sketched the plan of the splays with the buttresses, and at C the plan of those buttresses at the level D. Let us examine for an instant the trace of the splays of the arches indicated at E at a larger scale. The little columns arise from the bottom, resting on a slope with lower plinth, and form the principal rounds of the arches. Between them are drawn the pedestals supporting the statues, and the projecting angle leaves the line of the plinth at b. The horizontal projection of the canopy surmounting the great figures is a half hexagon c d e f; the back of the niche is the portion c d of an arc.

Over the canopies covering the great figures come the voussours of the archivolts with their canopies i, l, m, n, also giving the sketches of the little figures. The extrados of these voussours is at P. One will note with what geometrical method are traced both the horizontal plans and the elevations of that doorway. The lower section B proceeds by penetrations at  $45^\circ$ , always forming right angles, consequently easy jointing, in spite of the apparent complication of the forms.

But in Art. Trait we shall enter into more ample details on the procedures of the masters of the middle ages, and notably





at the beginning of the 14 th century, when it was necessary to establish superposed planes all proceeding from a generating principle adopted at the base of the edifice.

By this example one sees that the principal doorways of churches are no longer works that can be isolated, that they form an entirety with the monument, and enter into the general system of decoration. The more that one penetrates into the 14 th century, the more rigorously is this principle followed. It therefore becomes difficult to present these doorways without accompanying them by the facades themselves, at the middle of which they opened. Already the doorway of the calends of Notre Dame of Rouen is so intimately connected with the buttresses of the transept and rose window, that we have been obliged to indicate those parts of the monument, to make the comparison understood.

This observation cannot otherwise be applied to doors alone. The religious architecture of the 14 th and 15 th centuries no longer presents separate members, but is an entirety combined geometrically, a sort of learned organism; and those prisms, confusion of curves, superposed planes, that appear to the eye to form such a complex entirety, are traced according to very rigorous laws and a perfectly logical method. We so rarely today cause geometrical reasoning and the art of drawing to intervene in our architectural compositions, that we are easily repelled when it is necessary to study thoroughly the works of the masters of the 14 th and 15 th centuries, and that we find it simpler to condemn them as conceptions surcharged with useless details. But if one penetrates into the intentions of those artists, and takes the time to carefully analyze their works, he will quickly be amazed by the simplicity and the order that prevails in the methods, the rigorous logic of the laws adopted, and the science with which those artists knew how to employ the material in presenting the lightest appearance, while erecting structures eminently stable. For it is unnecessary to conclude from this, that in those monuments the parts merely ornamental deteriorate more or less rapidly, and that <sup>the</sup> work is not durable. The ornamentation is so combined that it can easily be replaced without weakening the structure in any way. On the contrary, that is independent and wisely conceived, is protected from deter-

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deterioration. It is indeed necessary that it should be thus, so that those monuments, so light in appearance, have been able to resist mutilations and the injuries of time, and that by the aid of some repairs of the surface, one can restore to them all their former splendor.<sup>1</sup>

Note 1.p.435. The two doors of the calends and of the library could thus be restored by the diocesan architects of Bouen, MM. Desmourets and Berthelemy, without too much trouble and expense.

The great doorways of our churches of the 14 th century present a system of construction and ornamentation analogous to that so well developed by the doorway of the calends. During the first two-thirds of the 15 th century were built in France few religious edifices. The misfortunes of the time and the exhaustion of resources did not permit this, and it was only under the reign of Louis XI that some works were commenced. Yet the general principles adopted for the doorways of churches were not changed, and it is only by the details of the style, that the latter works differ from those of the 14 th century. The gables assumed even more importance, the mouldings of the jambs and arches were multiplied; the statuary was stifled more and more under the profusion of the lines of the architecture and ornamentation; the tympanums frequently disappeared to give place to glazed openings; the lintels were curved as segmental arches; the prismatic mouldings were enlarged with great projections. At the beginning of the 16 th century, nothing was yet changed in the principal arrangements of these openings, as one can recognize by examining the doorways of the churches of S. Wulfrand of Abbeville and of S. Riquier; but in the two last monuments it may be shown that the doorways of the facades are so connected to them, both as architectural lines and as ornamentation and iconographic taste, that it is impossible to separate them.

The principal doorway of the abbey church of S. Riquier presents in its tympanum a tree of Jesse forming a glazed window. The idea is ingenious, but rendered with exaggerated labor in details and a poor style.

Among the doorways of the end of the 15 th century and the beginning of the 16 th, we mention those of the cathedrals of Tours, Beauvais, Troyes, Sens (north transept), Senlis (same),





the two last being very remarkable.

The north and south doorways of the church of S. Eustache of Paris likewise date from the beginning of the 16<sup>th</sup> century, and free themselves somewhat from Gothic principles.<sup>1</sup> It is necessary to cite here also, as belonging to the first period of the Renaissance, the principal doorways of the church of S. Michel of Dijon, of Vethueil near Mantes,<sup>2</sup> Sa Nizier at Lyons, Belloy, and Villeneuve-sur-Yonne. Those doorways almost entirely retain the Gothic rules in their general arrangement; splays, arches, mullion and tympanum; the new element scarcely appears except in the execution of the details of the sculptures and in the mouldings.

Note 1.p.436. See the work of M. Colliet, *Monographie de l'église Saint-Eustache*.

Note 2.p.436. See *Archives des monuments historiques* published under the auspices of the minister of the House of the emperor and of Fine Arts.

#### PORTES DE SECOND ORDRE, DEPENDANT D'EGLISES.

Doorways of the second order belonging to Churches.

Besides the great doorways opened at the middle of the principal and transept facades, churches possess an inferior order, opening either into the side aisles or the dependences, such as cloisters, sacristies, chapter halls, etc. Those doorways of small dimensions are sometimes quite richly decorated, or being very simple, are still impressed by a remarkable monumental character. They are closed by one or two leaves, but are without the central mullion.

We shall place in the first line here one of those doorways of the abbey church of Vezelay, as belonging to that beautiful Romanesque architecture of the order of Cluny at the end of the 11<sup>th</sup> and beginning of the 12<sup>th</sup> centuries.

This doorway (Fig. 71) consists of two jambs with fluted pilasters supporting two stilted archivolts, decorated by deeply sunk ornaments of great scale. The reliefs that decorate the lintel and tympanums represent the annunciation and the visitation; the birth of the Saviour; the angel arousing the shepherds and showing them the star; below is the adoration of the magi kings. On the capitals are sculptured two angels with extended arms; one of them sounds the trumpet; on those of the pilasters is an archer; opposite is a serpent with a





woman's head among the foliage. The angels announce the coming of the Messiah, the archer aims at the siren, the fall of the demon.

The height of the capitals and the unusual size of the ornaments give to that doorway a grand appearance of a rude severity, which produces a grand effect. The sculpture is further of very beautiful character. At A is given the plan of the doorway; at B is the section of the archivolt; at C is the section of one of the fluted pilasters. This door had a single leaf.

Before that epoch, i.e., during the 11 th century, the lateral or secondary doorways of churches are extremely simple. Most frequently and especially in the provinces of the Centre, they are composed of two jambs without mouldings, with a lintel reinforced at the middle of a relieving arch above (Fig. 72). In Auvergne, Nivernais, a part of Berry, upper Champagne and Lyonnais, exist some openings of this kind with a single leaf, that date in the last years of the 11 th century. Fig. 72 bis gives the section of one of those doorways, whose relieving arch forms a tunnel vault inside above the tympanum. In Burgundy the lintel forming a circular tympanum under the relieving arch is always employed, and that arch is decorated; for the Burgundian school is lavish in sculpture. At the south side of the nave of the church of Beaune is still seen a very pretty doorway of this kind and perfectly preserved. The jambs are accompanied by two little columns, and the archivolt is accompanied by a sculptured round (Fig. 73). This doorway date from about 1140. At A we give the plan, and at B the section. This door has two leaves.

The examples just drawn already indicate that the architects of the middle ages changed the arrangement of the doorways when they changed their scale. Thus these Romanesque doorways, independently of their dimensions, have a character entirely different from the principal doorways. The secondary doorways are not diminutives of those, and admitting that their dimensions were not indicated, they could not be confounded with the wide openings made in the facades of the great churches. There is an instruction not to be disdained; for the principal quality that every architectural member must possess is to appear to fulfil the function for which it is intended. Still





we do not find that appearance in perfect conformity with the function in the modern monuments. Many of the secondary doorways of our edifices are only reduced copies of great doorways, possessing the same members, proportions and ornaments, diminished in scale. Certainly that is not an advance, since it is not according to reason. One can also state that on certain monuments of imperial Rome, there is neglect of these rules of good sense and good taste, when it concerns doorways, and that the openings of the second order are composed like the greater openings, without taking into account the reductions of the scale.

The three first examples of Romanesque doorways just given belong to the schools of Burgundy and of the Centre. Those of Vezelay and of Beaune are distinguished by the strength of the mouldings and the breadth of the ornamentation, because these openings depend on edifices, whose members have a power, that one does not find in the monuments of the other provinces. But if we penetrate into Ile-de-France, Valois and Beauvoisis, on the contrary we see that doorways of a secondary order dating from the second half of the 12 th century are distinguished by the refinement of the mouldings. Very delicate taste and the absence of exaggeration in the proportions.

Here (Fig. 74) is a doorway opening laterally on the nave of the church of S. Remy-l'Abbaye, which is distinguished only by the beautiful arrangement of the jointing. A single moulding is very delicate and decorated by sinkings (see detail A), and surrounds the archivolt that relieves the lintel reinforced at the middle of its length. In that example is the trace of an art both sober and refined, which belonged to that province in the decline of Romanesque art. That recalls the antique structures of the best time.

If one desires to seize at a glance the variations of the French school at the end of the first half of the 12 th century, when it concerns doorways of an inferior order, it will suffice to examine Fig. 75, that gives at A a side doorway of the old church of Alet, now destroyed in part, and at B a lateral doorway of the nave of the church of Cinqueux (diocese of Beauvais). The doorway A seems copied from a Romano-Greek edifice of northern Syria; that of Cinqueux already frees itself from antique principles. The principle of construction





is identical for both examples, but the characters are different. This parallel sufficiently shows that our architecture of the 12 th century must be studied by provinces; like the dialects that have concurred in forming our language; that this study demands a delicate analysis of the collection of a great number of materials, if one pretends to appreciate the various sources from which our art of the middle ages drew before attaining the development of the lay French school.

We could accumulate examples suitable to emphasize the variations of the Romanesque schools of ancient Gaul in the expression of the same principle, but we fear to tire our readers by unduly extending this Article, already too long. The different provinces of the territory now called France based themselves on the same elements in the formation of their architecture as well as their language, during the 11 th and 12 th centuries. The low Latinity is the point of departure, but each province possessed a particular character; they suffer influences, either local or foreign: then comes a moment when the royal domain acquires a marked predominance in politics and literature as in the art of architecture. Then the arts of the provinces pass into a state of patois, so to speak, and the art that develops within the royal domain becomes the sole one officially recognized, that which everyone hastens to imitate with more or less skill and aptitude, and that ends by stifling all others. This is the important fact in our history, that distinguished minds however have pretended to regard only as an eccentricity, an oddity or a void. But why be surprised by the existence of a prejudice, when we can state that before the labors of M. Littre on the French language, men only saw in our provinces of the middle ages only the echoes of a rude and barbarous language, and that all the refined analysis of the learned was necessary to show to those, who took the trouble to read him, that this language of the 12 th century is complete, eminently logical and frequently filled with beauties of the first order. These are now acquired facts, and it seems equitable to give the name of barbarians to those among us that ignore them, when all Europe is associated in our labors, and regards our literature and our arts of the middle ages as the awakening of intelligence in the midst of the disorders, that succeeded the fall of the Roman empire.





Let us return to our doorways. The two examples of Fig. 75, which belong to the same epoch, take different characters derived from different schools; here is a third (Fig. 76), that differs from the two first. This doorway opens on the tomb chapel of S. Claire at Puy-en-Velay, a pretty monument built about the middle of the 12th century on an octagonal plan with a little semicircular apse. Its archivolt consists of black and white voussoirs, and its tympanum presents a mosaic in two colors. The lintel is decorated by a cross with halo of four disks on a slightly hollowed front. One finds here the most delicate expression of the Romanesque art of Auvergne arrived at its climax; it is difficult to produce more effect at less cost.<sup>1</sup> This art of Auvergne had then attained a very high plane, both in construction, harmony of proportions and tracing of mouldings, and still it must soon efface itself under the influence of the architecture of the royal domain.

Note 1. p. 443. See the entirety of the chapel of S. Claire of Puy in *Architecture et les arts qui en dependent*, by M. J. G. Goltzhaub. Vol. 1.

In 1212 was set the first stone of the cathedral of Rheims. The work was commenced at the choir and the two transepts; indeed at the base of the gable walls enclosing the latter, one notes the presence of round-arched windows, that again recall the arrangements of Romanesque churches. At the north side opens into the transept at the right of the principal doorway a secondary opening that formerly entered from the cloister and is now walled up. This doorway (Fig. 77) certainly belongs by the character of the sculpture and by its composition to the reconstruction of the cathedral of 1212, and one would rather believe to the end of the 12th than the first years of the 13th century.

A porch of a little later epoch was covered by a tunnel vault and protects the doorway, which has retained all its paintings. Its decoration consists of a statue of the Virgin seated in the tympanum beneath a very rich canopy with curtains. The round-arched archivolt is ornamented by statues of angels. At the crown is the Virgin in the form of a little nude figure carried off in a veil by two angels. Two other angels of larger dimensions fill the angles; one holds a cross and the other seems to bless. The top of the pointed tympanum is covered by





a painting representing Christ in his glory, accompanied by two adoring angels. The little jambs represent in front very delicate scrolls, laterally are clerics occupied in religious functions. The sculpture is entirely covered by brilliant coloring, but the subjects covering the tympanum behind the Virgin have disappeared. Two strong corbels support the lintel. (See section 7).

Examining this Fig., one recognizes that the Champagne architects of the beginning of the 13 th century sought new combinations, or at least that they knew how to profit by Romanesque traditions to apply them in an original fashion.<sup>1</sup> The sculpture of figures and ornaments of this doorway are very good, and are still uninjured by the style of the 12 th century, as if it had been entrusted to some old master. This fact sometimes appears at the beginning of the 13 th century. There was then evidently a young school tending to naturalism, and an archaic school in its decline; but we shall have occasion to state the influence and the antagonism of those two schools in Art. Statuaire.

Note 1.p.445. See the details of this doorway in *Architecture et les art qui en dependent*, by M. J. Gailhabaud. Vol.II.

The cathedral of Amiens was commenced in 1220, several years after that of Rheims. The primary constructions comprised the nave and the two transepts, and it is probable that Robert of Luzarches, the architect of this beautiful monument, could erect only the substructures of his project. One can easily recognize the parts of the edifice over the construction of which he presided. These are the buttresses and piers of the nave up to the height of the capitals of the side aisles, the lower parts of the great western doorway, and the base of the south gable wall of the transept. In the primitive plan, the nave comprised no chapels; beautiful windows directly lighted the side aisles;<sup>2</sup> but under the first window of the nave at the south and near the western facade, opened a secondary doorway into the cloister, established at that side. This doorway is now masked by a porch of the 14 th century, and nowise recalls by its style the lateral doorway of the cathedral of Rheims that we have given (Fig. 77). Because between the architecture of Champagne and that of Picardy the differences are notable at the beginning of the 13 th century, and still the





architects of those monuments both came from the royal domain; but it is evident (if not to their praise) that the masters knew how to lend their talent to local traditions, to the quality of the materials placed at their command, and to the genius of the people that called them. The lateral doorway of the nave of Notre Dame of Amiens still in the details of the sculpture is somewhat impressed by the style of the 12th century, but the composition is entirely new. First it is accompanied by two blind arches comprised between the buttresses; the three arches (the central one being almost round) are surmounted by gables represented by a simple bevel; its entirety is wide and low; statuary is excluded from it. In fact, as the Gothic architecture of Champagne is at its origin lavish with sculpture, so as that of Picardy sparing of it. But on the contrary, the sculpture of ornament is rich and broadly developed; the capitals of that doorway are beautiful (Fig. 78); the abacuses and even the astragals are decorated; the tympanum is covered by diaper work and rosettes with great character. The arches are already accompanied by cusps and the mouldings are fine and multiplied. One finds in that secondary composition the amplitude, which is one of the most beautiful qualities of the cathedral of Amiens. There are no longer the massive and elongated proportions of the cathedral of Rheims; the supports are slender and the openings are wider. Thus the artists knew how to put variety in their works and to adopt a system, followed faithfully in all the details as well as in the entireties of their compositions. At A is traced the plan of the lateral doorway of the cathedral of Amiens; at B at 1:20 of full size is the section of a jamb with its monolithic column, the abacuses of the capital and the trace of the archivolts on these abacuses, the mouldings a and b forming the cusps; the face of the tympanum being at c. At C is given at the same scale a fragment of diaper work that decorates the lintel-tympanum.

Note 2.p.445. Art. cathédrale, Figs. 19, 20.

About the same epoch was rebuilt the cathedral of Chartres on its earlier foundations. At the feet of the two western buttresses of the transepts, the architect of the beginning of the 13th century placed two doorways intended to give entrance to the crypt. These doorways are extremely simple and

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only recommend themselves by the beauty of their construction. We give one of them (Fig. 79). A large splay cuts off the jambs and archivolt externally; the lintel-tympanum is supported by two corbels, and is pierced by an opening intended to light the crypt. At A is traced the section of that doorway. Here again can one seize the harmony distributed in the edifices of the beginning of the 13 th century. By its character alone, this architectural member distinguishes doorways belonging to religious monuments from a more robust appearance. The principle of construction is always the same; but the rudeness of the forms of Notre Dame of Chartres makes itself felt in this detail. Opened in the side of Notre Dame of Paris or of Notre Dame of Rheims, this doorway would make a blemish, while it is in its place here and does not contrast with all that is around it. To see by itself one of these doorways, one can then say not only to what epoch, but also to what monument it belongs. Could one classify in a manner as certain the different members of our monuments? Is this unity, so necessary in every work of art observed as a rule in our days?

If we abandon this primitive Gothic art, and if we penetrate into its derivatives about the second half of the 13 th century, we can still find many examples of doorways to collect.

We have seen that certain provinces like Poitou, Saintonge and Limousin, in the Romanesque epoch had adopted doorways with neither lintels nor tympanums; that tradition was retained during the Gothic period in the same provinces and in the countries subject to the influences of those schools. This we see at the abbey of Beaulieu, a church of the second half of the 13 th century, whose doorways are still without lintels and tympanums, like that of the Southerraine that we have drawn. (Fig. 61). One of the secondary doorways of the church of Beaulieu is also noted for the beautiful and broad arrangement of its archivolt and the purity of its proportions (Fig. 80). The section A of this doorway shows that the archivolt with great voussoirs is turned only in part, and that the leaves open up under a rear vault a, formed by a segmental arch. The moulding b of the archivolt is intended to connect the facing voussoirs to the construction. This moulding is then not merely an ornament, it is a necessity of construction utilized by the architect. In fact, it is necessary to consider those projecting





mouldings that sometimes circumscribe the voussoirs of the archivolts of doorways during the 12<sup>th</sup> and 13<sup>th</sup> centuries, as a means of avoiding ruptures. The arches often having only a small thickness, like the facings over them, it was useful to bond these stone facings to the structure; the projecting moulding of the archivolt fulfilled that office, like the courses of the abacuses for the capitals. This system was the more necessary here, because of leaves having to open to the crown of the pointed arch, opened beneath the rear vault, that could not be concentric with the front arch. Constructors never cut that rear vault in the upper voussoirs, for they carefully avoided defective masonry. Then they made two abutting arches; that of the head covering the opening at the front, and that of the internal recess forming the rear vault; then the external moulding bonded together these two arches by making them solid. In the construction of the doorways, such as those of churches, opened under thick and high walls, the architects took good care to avoid ruptures by cutting the extradoses of the arches and not bonding them to the facing. So that these arches under a considerable pressure should not tend to leave their planes, they were frequently set with a row of voussoirs of little thickness, but with strong tails.

By analyzing thus the members of this architecture that seem purely decorative, one recognizes the common and practical sense of the architects of the middle ages. There is not a form for which one cannot render a reason, not a detail which is not justified by a necessity of the construction. Those architects can thus teach us something, were it only to reason a little when we build. Then how should we be surprised if certain modern schools, that the custom of reasoning generates in the use of unjustifiable forms which they extol, pretend that this art of the middle ages is barbarous, and that its study is only good for corrupting the taste, only to stifle what they desire to regard as sane principles?

For those schools the art of architecture seems to be only an affair of faith, and they would say frankly like S. Augustine:— "I believe because I do not understand." We should say more frankly concerning architecture:— "Do not believe unless you understand." But to comprehend, it is necessary to analyze, reason, collect and compare; this is sometimes a long and pa-

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painful labor; rather than devote themselves to this, men prefer in certain cases to condemn without seeing, judge without knowing, and continue to pile up materials in excess, without economy and without reason.

If in the largest doorways, as in those of moderate dimensions, that we have presented to our readers in the course of this Article, one computes the volume of materials employed to resist the enormous loads, he will find that this volume is very small compared to the pressures received; that is to be considered.

Conditions are sometimes presented, such that the architects could avoid round or pointed relieving arches forming the covering of an opening, but dared not trust to a simple lintel, for example when doorways open in a wall of small thickness and of moderate elevation; they content themselves with a circular arch forming the head, or they design a depressed arch. There exists a pretty doorway established under those conditions and opening in the wall of the old sacristy of the cathedral of Clermont.<sup>1</sup> That doorway dates from the last years of the 13th century; its arch is a depressed pointed (Tudor) arch (Fig. 31), whose centres are placed at a and b. Its profile drawn at A at 1 : 10 full size is decorated by two hollows sculptured with much delicacy in lava from Volvic. The base of the jamb as detailed at A is very happily composed. This doorway is internal; (that should not be forgotten); it opens on the side aisle of the choir, and in fact it takes the forms in general and details that suit that place. One rarely notes in France this form of depressed pointed arches. However this example tends to prove how the artists of that time retained complete independence in the use of forms, that they believed they should adopt, however little they subjected themselves to routine.

Note 1.451. This sacristy is arranged in the square chapels of the choir of that church at the southern side. (Art. Cathedral, Fig. 16).

In speaking of the principal doorways of churches, we have stated that particularly in the province of Champagne, one notes a great number of doorways whose tympanums are windows. Thus are composed the western doorways of the cathedral of Rheims. One likewise sees in that province secondary doorways





of churches with lintels surmounted by an actual window forming an entirety with the door below. The church S. Urbain of Troyes again supplies us with an example of this sort of openings into the two side aisles.<sup>1</sup> Those doorways were preceded by a porch that was not finished. Fig. 82 gives one of these; a great glazed window surmounts the lintel; the pointed arch of that window serves as side arch of the vault of the porch, whose sides rest on the two little columns A. (See section B). The jambs of the doorway, lintel, tracery and arches of the window are built of lias from Tonnerre, while the facings are constructed of low courses of stone from Bassancour, quite coarse in appearance but strong. At C we give the section of the jamb made on a b.

Note 1.p.452. See plan of the church S. Urbain in Art. construction, Plé. 102.

In the composition of these doorways of churches surmounted by windows, the architects of Champagne seem to have not only desired to pierce openings wherever practicable, but especially to decorate internally the tympanums of doorways, whose nudity behind the reliefs contrasts with the external richness. If this only concerned the secondary doorways, this was a means of lighting the vaults of side aisles under the towers of facades, of obtaining an effect analogous to that produced by the great windows with roses pierced over the principal doorways of the high naves.

For example, at the cathedral of Chartres, the doorways of the transepts at north and south are marvellously sculptured on the exterior; their tympanums, arches and jambs, are covered by statues, reliefs and ornaments; but in the interior they present at the base of the gable walls only plain surfaces scarcely relieved by bands indicating the arches; these are only backs that seem to await decoration. Perhaps the architects of these grand edifices must have ornamented these backs by lobbies of joinery and by paintings, but no trace remains of those arrangements today. What leads us to suppose that lobbies and joinery must have been attached to the backs of those drawings is that frequently the jambs or mullions show projections like unfinished pilasters. In Champagne lobbies must certainly enclose these internal splays of the grand and medium doorways of churches. The depth of those splays is cal-

calculated to allow the leaves to open without requiring the  
... of the garden of St. Nicolas of France did not prove in the  
... were finished with foliage. (Arch. France, 1912, 29).  
... of France) looked the interior over these foliage and con-  
... of that cathedral even did more, for he occurred  
... placed in a supposed niche.

The foliage projecting from the surface, it was therefore  
conceived, that the back of the facade inside was worthy of  
the exterior. In the de-France, p. 10, and in general in all  
the churches of the middle ages of the period called Gothic,  
one should note that the experiments, or at least the lack of  
composition in the composition of these backs of the principal  
and median doorways. The way lack of composition, because in  
fact aside from traces of attempts that frequently remain, o-  
ne sees several secondary doorways with backs were skillfully  
composed. On the southern side of the choir of Notre Dame of  
Paris exists a little doorway, that formerly opened into the  
cloister. That exit was known under the name of the doorway.  
and is a masterpiece of the second half of the 12th century.  
Its sculpture and the workmanship are in admirable taste.

Now in the interior this doorway presents sober and well in-  
ended decoration, evidently intended to receive a lobby of  
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ral of Paris, the back of the southern doorway is occupied by  
... and by two others connected by canopies



calculated to allow the leaves to open without reaching the internal face, suffices to demonstrate this, even if the plan of the church of S. Nicaise of Rheims did not prove in the most positive manner, that the doorways of the facade and transepts were finished with lobbies. (Art. Porche, Fig. 29). Then the glazed windows over the doors (as at the cathedral of Rheims) lighted the interior over these lobbies and contributed to the general decoration. The architect of the western facade of that cathedral even did more, for he occupied all internal surfaces beside and above the doorways by stories placed in superposed niches.

The lobbies projecting from the surface, it was therefore conceived, that the back of the facade inside was worthy of the exterior. In Ile-de-France, Picardy, and in general in all the churches of the middle ages of the period called Gothic, one should note that the experiments, or at least the lack of completion in the composition of these backs of the principal and medium doorways. We say lack of composition, because in fact aside from traces of attempts that frequently remain, one sees several secondary doorways with backs very skilfully composed. On the southern side of the choir of Notre Dame of Paris exists a little doorway, that formerly opened into the cloister. That exit was known under the name of Red doorway, and is a masterpiece of the second half of the 13<sup>th</sup> century.<sup>1</sup> Its sculpture and the mouldings are in unimpeachable taste. Now in the interior this doorway presents sober and well intended decoration, evidently arranged to receive a lobby of joinery. Opening at the back of a chapel, it is surmounted by a window, partly masked by its gable.

Note 1.p.454. By its style this doorway evidently belongs to the rebuilding of 1257; although most of the guide books, we know not on what authority, mention it as belonging to the 15<sup>th</sup> century. The 15<sup>th</sup> century did not set a single stone in the cathedral of Paris.

At the cathedral of Meaux the architects of the 13<sup>th</sup> and 14<sup>th</sup> centuries have also decorated very richly the backs of doorways of the transepts by means of an entire system of little piers, arches and gables as a facing. Even at the cathedral of Paris, the back of the southern doorway is occupied by arches with gables and by two niches ornamented by canopies





and intended to receive statues. But this entire gable wall dates from 1257. It would appear that before that epoch, on the contrary the architects avoided to compose decorations in stone at the backs of great doorways. Yet already at the beginning of the 13<sup>th</sup> century, as for example at the cathedral of Chartres, the gable walls over those great doorways were pierced by rose windows and by open galleries filled with brilliant glass; it scarcely appears probable that below a decoration as simple and rich, that they would have desired to allow the bare walls to appear, and the backs of the wooden leaves. We shall remark that in those great churches because of the architectural system adopted, there remained nowhere a wall surface, all being occupied by glass, piers and arches; consequently no surface for developing painted subjects. Now there is every reason to believe that those wide spaces below the rose windows and galleries, above and beside the doorways on the inside, were intended to receive paintings; no place was more favorable, and one imagines then what effect would be produced by those enormous areas, all resplendent with stained glass in their upper parts, filled by paintings in their lower parts. Let one also assume below these paintings, behind the leaves of the doorways, beautiful lobbies of joinery, and complete in thought the decorative system of those immense surfaces, whose bareness now appears inexplicable. But about the second half of the 13<sup>th</sup> century, it seems that men renounced the placing of painted subjects anywhere except in the windows; then the architects decorated the backs of the doorways below the gables as at Rheims, Meaux, and even at Paris.

The 14<sup>th</sup> century did not furnish in the construction of its religious monuments new arrangements for doorways of the second order; the vagaries of the end of the 13<sup>th</sup> century are followed, and the examples that we could present would differ only by some details from those already given. As for the 15<sup>th</sup> century, it began to construct churches only toward its last years; and if the doorways of the civil edifices of that epoch have a very decidedly original character, those belonging to religious monuments are only noted for the skill of draftsmen and the delicacy of the sculpture. For the general arrangement, they return to the examples last given here. (Arts. Trumeau, Tympan).





## PORTES D'EDIFICES CIVILS , EXTERIEURS ET INTERIEURS.

## External and Internal Doorways of Civil Edifices.

In the cities of the middle ages, the castles and the palaces alone possessed carriage gateways, and those entrances were laboriously fortified. As for the doorways proper of houses, if those habitations were provided with courts, there were only what we term alley doorways, i.e., arranged only for persons on foot, with a width of 3.3 to 4.9 ft. and a height at most of 8.2 to 9.3 ft.

We know no doorways of civil edifices belonging to the 11th century in France, that present any special character. Entrance openings are further very rare from that epoch, and consist only of two jambs with a round arch of small masonry, and do not differ from the little church doorways, that one still sees opened in the sides of some religious monuments of Beauvoisis, Berry, Touraine and Poitou.

It is only at the commencement of the 12th century that one can assign a civil character of the doorways of houses, and it is still in the city of Vezelay within that old commune, that we find examples of those entrances of the houses of citizens. Among those houses some possess a first story over a ground story, and sometimes a square tower. The external facade was pierced by rare and quite narrow windows, the light in the apartments being received from a little internal garden. From the street to the garden one passed through a tolerably spacious vestibule and by a relatively wide round-arched doorway. Fig. 83 gives the external elevation of one of those doorways at A, its section at B. At C we have sketched at 1:5 full size the sections of the two archivolts. One will note that this opening (that further is repeated several times on facades of houses of the 12th century at Vezelay with some modifications in the details) nowise recalls the style of the religious architecture of the abbeys. This doorway has a civil character, rather approaching those Romano-Greek edifices of Syria previously mentioned. Inside is erected a rear arch D, that alone allows opening the leaves. Those doorways of houses of the 12th century are sometimes accompanied laterally by a square window, a sort of wicket pierced at the height of a man inside, which allowed an examination of the persons that knocked; or also a window above the archivolt, the light-





lighted the vestibule.<sup>1</sup> Soon were abandoned however these round arched doorways for entrances of habitations, or at least stone lintels with tympanums were placed under these arches, that remained as relieving arches. Thus are conceived the doorways of the houses of the cities of Cluny and of Provins built about the end of the 12 th and the beginning of the 13 th centuries. Frequently even the relieving arch disappeared entirely on the exterior and only forms a rear arch inside. The wooden leaves fitted the round-arched form very badly; it was simpler to give these leaves a rectangular form, particularly when composed of a single leaf. The semicircle was then abandoned for these doorways, being replaced by the rectangular opening. If the archivolt remained, it only relieved the lintel, so as to prevent it from breaking under the load. Then rarely in civil architecture the tympanum is decorated by sculptures. One still sees in the buildings formerly dependant on the abbey of S. Vane, now enclosed in the citadel of Verdun, a doorway of that kind, whose composition is original, and which dates from the first years of the 13 th century.

Note 1.p. Art. Molsen, and the work on *Architecture civile*, by Mm. Verdier et Cottais.

This doorway (Fig. 84) is composed of an archivolt with doubled voussoirs resting on decorated jambs, at each side being two little monolithic columns, as indicated at A in the horizontal section of one of these jambs. The archivolt forms a relieving arch and an internal arch at B (see section). Corbels relieve the lintel-tympanum ornamented by foliage. But so sometimes those external doorways of houses were furnished with permanent hoods of stone or wood, to allow persons knocking at the door shelter while one came to open to them. There still existed a few years since a doorway of the 13 th century so designed, as the facade of a little house of Chartres.

This entrance (Fig. 85) has a width unusual for an alley doorway, and was flanked by two projecting jambs like reveals, bearing two corbels on which rested a stone gable, forming a strong projection over the street. An archivolt B flush with the wall (see section A) served as a relieving arch over the tympanum, and was pierced by a little window designed to light the vestibule when the leaves were shut.<sup>1</sup> The gable-hood consisted of simple slabs extending into the surface of the wall.





Because of the width of the opening the lintel was replaced by a segmental arch with internal rebate to receive the two leaves. We give at C at double size the section of one pier. It seemed that this sort of entrance was habitually employed in this province, for the church of Blanc still possesses a doorway constructed according to the same arrangement, but without a lintel.

Note 1.p.459. This house has since been destroyed; we were only able to find its site during a last journey in the department of Indre.

The corbel, the impost of the segmental arch, and the penetration of the archivolt, were cut in the same stone. The impost of this archivolt is likewise solid with the corbel course G. But the materials at command did not always permit making stone projections of a nature to resist storms. Without changing the programme, the architects of the middle ages, sometimes established wooden hoods above the doorways of houses. Fig. 186 gives us an example of these entrances of houses. We have assumed the hood to be removed at one side, so as to show better how it was placed.<sup>2</sup> At B we have sketched the section of this doorway with the rafters of the hood, and at C the section of one of the jakbs at double size. This doorway dates from the second half of the 13 th century; it was closed by a single leaf.

Note 2.p.459. This doorway comes from a house of Chateau-Vilain.

If there be a great variety in the forms of doorways at that epoch, i.e., during the 13 th century, civil architecture presents a no less great number of original arrangements, and yet we no longer possess in France but a few houses built from 1180 to 1300.

Further, during that period, it was a quite frequent custom, especially in the provinces south of the Loire, to build houses with porticos. Then on the public street the doorway was merely a simple arch or rectangular opening composed of two jambs and a lintel. Also frequently the ground stories of city houses were occupied by shops, whose fronts opened under arches: -<sup>3</sup> one of those arches served for entrance to the stairs communicating with the upper stories. The closure consisted of a frame with leaves. During the 14 th century the doorways of houses are generally simple, and are very rarely dec-





decorated by sculptures; they only consist of a pointed arch-volt flush with the wall with lintel beneath, or of a rectangular opening with stopped chamfers on the angles. Yet already about the end of that century appeared the arch cut in the lintel. On the contrary, the doorways of palaces built during this period are of great richness. Those of the palace at Paris, and which exist in some remains and doorways, were very beautiful. (Art. Perron). Those of the stairway of the Louvre, built by Charles V, were likewise very ornate.

Note 3.p.459. Art. Molson, and the work already cited by MM. Verdier & Gattois.

The 15<sup>th</sup> century, during which were built few churches, saw arrive a number of castles, palaces and houses, whose external doorways were decorated by sculptures, figures and arms. Among those palace doorways of the 15<sup>th</sup> century we should place in the first line that of the mansion of Jacques Coeur at Bourges, still nearly intact today. It was in 1443 that the celebrated treasurer of Charles VII commenced the construction of this beautiful residence. Arrested in 1451 at Taillebourg on the order of the king by Olivier Coetivi, Jacques Coeur could scarcely enjoy the mansion, that he had built in his native city. The portal of that mansion (Fig. 37) is opened beneath a rectangular loggia occupying nearly the middle of the facade on the street. It consists of a carriage gateway with a postern at the left side. The carved wooden leaves of the great opening are also pierced by a very narrow wicket surmounted by a knocker, and open in rectangular form within the pointed arch under a vaulted portal with segmental vault. Above the doorway is formed a recess, partly at the expense of the wall, partly corbelled, that recess being covered by a very open canopy supported by two delicate piers; it contained an equestrian statue of king Charles VII.<sup>1</sup> A wide window with tracery opens on that recess and lights the chapel in the second story. At the sides of the recess are inscribed two complete windows, that on the right opening at the side with the entrance of the kitchens, having the figure of a woman, and that on the left on the side next the city, having a figure of a man. Those two statues are visible only as busts above the balustrade, appear to look outside and seek what occurs on the public street. Thus as M. Vallet de Viriville said in

the curious note on James Court, that he recently...  
 "These two figures seem to represent...  
 records the public and respected names referred to...  
 record authority by the office of the king, but as the...  
 time and under the same epoches, the personality and...  
 identity of James Court is disclosed as...  
 and freedom." Indeed, on this point as on all...  
 the of the entire social system, children's souls and...  
 of the character of plots and over the doorway of the...  
 of competing.

Note 2-2-1882. See James Court, by H. Vollet de Villalbe.  
 1882.  
 One will note that the text of symmetry notes entered...  
 the...  
 and, the main and decorated part balance in an entirely...  
 of fashion, without any over being offered by this...  
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 and the proportion has opened them between two walls...  
 one... He took the text of the latter for...  
 window... and he has... the...  
 with... to form a...  
 a... and... story. The... filled on the two...  
 and... the... of the... the...  
 the... and the... look... to... a...  
 opened of the... of each of them, that...  
 opens... the... of the...  
 the... the... of the... of...  
 and of... as... that... exist and are several...  
 later than that. In Art. Mason we have presented some...  
 line of the... and is... that will...  
 with... more details of this... part of the...  
 of the... with...  
 the... of...  
 color... to further indicate... the... of...  
 of the... with...  
 with... the...  
 since it was necessary for the... to... the...  
 revolution of the... But then this... was often...



the curious note on Jacques Coeur, that he recently published;<sup>2</sup> "Those two figures seem to represent Vigilance. On the front appears the public and respectful homage rendered to the sovereign authority by the officer of the king, but at the same time and under the same protector, the personality and individuality of Jacques Coeur is displayed with remarkable assurance and freedom." Indeed, on this portal as on all other parts of the edifice appear hearts, pilgrim's shells and the motto:- "Nothing is impossible to valiant hearts."

Note 1.p.462. The same arrangement is found at the entrance of the chateau of Blois and over the doorway of the city hall of Compténe.

Note 2.p.462. See Jacques Coeur, by M. Vallet de Virville. Paris. 1864.

One will note that the idea of symmetry nowise entered into the composition of this portal, and yet the voids and the solids, the plain and decorated parts balance in an entirely happy fashion, without the eye being offended by this shifting of the axes. There were required a carriage way and a postern, and the architect has opened them between two walls that form the pavilion. He took the axis of the latter for opening the window lighting the chapel, and he has combined the recess with that window to form a great upper arrangement, indicating a high and vaulted story. The windows filled by the two figures fall under the angles of the pavilion; but those windows are solid, and the architect took care to assume a partial opening of the leaf of each of them, that strengthens their piers under the angles of the pavilion.

We shall cite the entrance doorways of the mansions of Sens and of Cluny at Paris, that still exist and are several years later than that.<sup>3</sup> In Art. Maison we have presented some drawings of the 14 th and 15 th centuries,<sup>4</sup> that will dispense with entering into more details of this important part of the habitations of the middle ages. Still we shall say some words on the external doorways of stairways, which present a particular arrangement. We further indicate<sup>1</sup> how the stairs of habitations of the middle ages were nearly always built as screw stairs. This system required the opening of quite low doorways, since it was necessary for the lintel to conceal the first revolution of the steps. But then this lintel was often regar-

rested as an incense burner by a window lighting the  
 out revolution. He had again in the manner of John  
 (29). The final focus an incense and presence an  
 sculpture. Three trees are detached from the background.  
 In the center of the composition, the tree is the  
 most, the tree is the most of the tree, the tree is  
 the tree grow exotic plants, which is a tree, the  
 tree is the tree, the tree is the tree, the tree is  
 tree, and that he carried on an extensive commerce with  
 countries. These plants seem to be emblematic of these  
 and perhaps to see different treasures, as one the  
 tion into traces of some of our medicinal and garden plants.  
 Around these relief is seen the device, repeated several  
 in the manner: -- "a tree, -- a tree, -- a tree, -- a tree."  
 the figures being separated by phrases of clouds.

Note 1. p. 102. See also. 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.

Note 2. p. 103. See *Notices sur les monuments de Bery, par M.*  
 1884.  
 The internal doorways of palaces and houses, i.e., those ap-  
 pearing from one room into another, are generally very small,  
 low and narrow, before the end of the 17th century. They are  
 only openings allowing a single person to pass out at a time.  
 These doorways were further equipped with porticoes. In no in-  
 stantiation of the middle ages, even if originally, did one find  
 our modern manner, for the very natural reason that however  
 noble they were, the persons passing through these doorways  
 did not have heights reaching 6.0 ft. If those doors are  
 given with to allow easy passage, they do not exceed 5.2 ft.  
 below the lintel.  
 Only under the reign of Louis XIV did men commence to  
 doorways of greater height; that was then regarded as  
 noble, if not more sensible.  
 The internal doorways of palaces of the middle ages



regarded as an impost surmounted by a window lighting the second revolution. We find again in the mansion of Jacques Coeur at Bourges a complete example of this sort of doorway. (Fig. 33). The lintel forms an impost and presents an interesting sculpture. Three trees are detached from the background. That in the middle represents an orange, the one on the right is a date, and that on the left is a sort of mimosa. Between these trees grow exotic plants, among which is a carnation. It is known that Jacques Coeur made several journeys to the Orient, and that he carried on an extensive commerce with those countries. These plants seem to be emblems of those relations, and perhaps to the illustrious treasurer, we owe the introduction into France of some of our medicinal and garden plants. Around that relief is read the device, repeated several times in the mansion: - "To hear, -- speak, -- act, -- be silent." the letters being separated by branches of plants.

Note 3.p.462. Art. Maison, Fig. 33.

Note 4.p.462. See Figs. 21, 24, 25, 27, 28, 29, 37. Also Art. Salle.

The first revolution of the stairs passes behind that lintel and is lighted by the window at the height of the impost.<sup>2</sup>

Note 1.p.463. Arts. Chateau, Escalier, Maison.

Note 2.p.463. See *Notices sur les monuments du Berry*, by M. Hozé. 1834.

The internal doorways of palaces and houses, i.e., those opening from one room into another, are generally very simple, low and narrow, before the end of the 15 th century. They are only openings allowing a single person to pass out at a time. These doorways were further equipped with portieres. In no habitation of the middle ages, even if princely, did one find those doors of apartments 9.8 or 13.1 ft. in height, as in our modern mansions, for the very natural reason that however noble they were, the persons passing through those doorways did not have heights reaching 6.0 ft. If those doors are sometimes wide to allow easy passage, they do not exceed 3.2 ft. below the lintel.

Only under the reign of Louis XIV did men commence to open doorways of greater height; that was then regarded as more noble, if not more sensible.

The internal doorways of habitations of the middle ages are

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...the ... of the ... and ...



very simple, because they open behind tapestries, and one scarcely perceives more than the jambs and lintel. Their leaves alone were wrought with care. The lintels are either straight or a part are a corcular or segmental arch. One already sees in the buildings of the beginning of the 14 th century appear those lintels drawn with three centres; but particularly about the end of the 15 th century their use is frequent. During the 13 th and 14 th centuries those lintels are frequently relieved by corbels arranged in the thickness of the facings. Then (Fig. 89) a chamfer or moulding extends around the opening at the side opposite the rebate of the leaf, for it is very rare for those doors to have two leaves.

About the end of the 14 th century corbels relieving lintels are no longer employed for the doorways of apartments. Those are rectangular and are sometimes ornamented by a round forming a little column with capital and base (Fig. 90). Thus are constructed the doorways of rooms of the castle of Pierrefonds. Above the lintel is arranged the keystone of a relieving arch, and on the side of the rebate is made an arch; or if the doorways are narrow, a ceiling of a single piece of stone. The round that decorates the facing, the capital and base are also cut in the square angles of the jambs and do not project from the face of the wall.

In habitations decorated with luxury, the lintels were surmounted by joinery over the doorway, for we have frequently found the existence of fastenings on these lintels and on the surfaces above them. If our modern mansions were ever abandoned, pillaged and ruined, one would be embarrassed to state what composed the ornamentation of our doorways of apartments, for after all then are merely rectangular ofenings in a wall, the opening covered by woodwork, stucco and painting. Without giving such an important part to borrowed ornamentation, however the architects of the middle ages occupied themselves only with the enclosure of the front that remained visible, the wainscot, soffits of the doorways and the tapestries did the rest, stone did not absolutely appear except on the front of that moulding enclosing it. That simplicity of the openings of internal doorways was concealed under the richness of the woodwork and hangings that contributed to the decoration of the rooms, for it is unnecessary to believe, that our ancest-





ancestors dwelt within naked walls,<sup>1</sup> like those seen in the ruins of our castles. Many doorways of apartments were further equipped with lobbies or closets, that rose only to a height of 6 to 7 ft., and prevented the external air from entering the room when a door was opened. Men did not then possess hot air furnaces, and if a door were opened, a very disagreeable volume of cold air was introduced into warmed rooms. Those lobbies and portieres were intended to avoid that inconvenience. One knows how men froze in the apartments of Versailles, due to those noble doorways, that each time that the door was opened admitted some 700 cu. ft. of icy air into the rooms with a fire, and how Madame de Maintenon, who feared drafts, found no other remedy against that perpetual draft, than to place her armchair in what Duke S. Simon called a cask.

The doors of the rooms of the middle ages, and until the reign of Louis XIV, are then low and narrow, and if one may so speak, are merely valves well furnished with clappers to prevent currents of air. It is necessary to take their part. Those doors were only enlarged when they served for communication between great halls intended to offer a series of rooms suitable for giving a festival, or for receiving a great assemblage of people, but they always retain a height varying from 6.6 to 8.2 ft. at most.

Perhaps one would take an idea of the manner in which those doors of rooms were decorated in castles or palaces. To render intelligible what we have just said on this subject, that we have combined in Fig. 91 the information collected, both in civil edifices of the end of the 14th or the beginning of the 15th centuries, and in vignettes of manuscripts, paintings and reliefs. One sees that the drawing properly so called, the opening in stone, is scarcely visible; the jambs and the soffit are alone visible. Above it is fixed a great work of painted joinery, that accords with the moulded supports of the tapestries. Those tapestries stop at the lower wainscot, that generally covered the base of the walls. The part of the wall left bare between the ceiling and the tapestries was decorated by painting, and a portiere was suspended from the woodwork over the doorway.

It occurred that certain doors of apartments were entirely covered by the tapestry, that that was only divided to allow





the occupants to pass. Those were true doors under hangings.

The examples of doorways of apartments of the end of the 15<sup>th</sup> century are not lacking, and one can find them everywhere; they are generally covered by a segmental arch, and sometimes that arch is crowned by a recurved portion (keel arch). Pretty doorways of that kind are still seen at the palace of the dukes of Burgundy at Dijon, mansion of Cluny at Paris, archbishop's palace of Evreux, palace of justice at Rouen, and in many chateaus of that epoch, such as those of Amboise, Blois, etc.

The epoch of the Renaissance erected very beautiful external and internal doorways in the residences of nobles or in houses; but the extent of this Article will not allow us to pass the limit of the Gothic era. If we desired to select among the beautiful examples of doorways of the beginning of the Renaissance, we should be carried much too far. Besides, those examples are reproduced in a great number of works placed in the hands of all our artists.

#### PORTIQUE. Portico.

This word was only introduced in the language of architects after the 16<sup>th</sup> century. But if the word did not exist during the middle ages in French, they possessed the arrangement. Men said porch, if the portico was small and presented itself before the entrance of an edifice; cloister, if it surrounded a court; piers if it extended before the facades of palaces and houses on the public street or a yard. Gregory of Tours speaks of porticos of wood painted in bright colors, that surrounded the courts of the Merovingian palaces. Eginhard<sup>1</sup> reports that the emperor Louis the Good-natured passing over a wooden portico on Thursday of holy week in returning from the church, that wormeaten structure fell, carrying down in its fall him with his suite. The vignettes of manuscripts of the 9<sup>th</sup> and 10<sup>th</sup> centuries quite frequently show porticos composed of columns with arches closed by draperies; they are seen represented on the tapestry of Bayeux. Yet it does not appear that during the middle ages, as during Greek and Roman antiquity, were erected porticos only designed to serve as walks and shelters for the inhabitants of a city. They always formed a part of an edifice, extending beneath the house on the public street,<sup>1</sup> or opened on the courts of monastic establish-





establishments or palaces.<sup>2</sup> What distinguishes the portico from the cloister properly so called, is that the first is a covered gallery presenting a single front, while the cloister entirely surrounds a court by means of four porticos serving the buildings placed around a square. As for the arrangements in detail of those porticos, they recall those adopted for cloisters. They are simple piers bearing a shed roof or a girder, then supporting upper stories, and having a ceiled or vaulted ceiling. Thus the episcopal palace of Laon beside the cathedral presents a beautiful portico of the beginning of the 13<sup>th</sup> century, composed of cylindrical piers supporting pointed arches with a wooden ceiling.<sup>3</sup> Unfortunately the arches of that portico were rebuilt in the 14<sup>th</sup> century; a single arch remains intact, forming the end of the portico on the western side; we present it here (Fig. 1). There existed at the palace of Paris beautiful vaulted porticos opening on three sides of a yard and thus forming a sort of cloister.<sup>4</sup> Before the erection of the existing city hall of Paris, the citizens of the city assembled in houses located on Place de Greve, and designated by the name of houses with piers, because they left in the ground story on the public street, a portico composed of stone piers supporting girders with upper stories. Men also spoke of the pillars of the markets of Paris, to designate the porticos arranged on the houses surrounding the market place, and which served as a shelter for purchasers. Many cities of the middle ages had their houses built over porticos;<sup>5</sup> but those never presented a uniform architecture, each man arranging his portico as seemed good to him; which gave to those covered alleys a more picturesque appearance. There was still seen at Luxeill a few years since a street entirely opened on this system, original in appearance and pleasing by variety.

Note 1.p.468. Louis the Good-natured. 817.

Note 1.p.469. Art. Maison.

Note 2.p.469. Art. Cloître.

Note 3.p.469. For this entire portico, see Architecture civile et domestique of MM. Verdier and Battois. Vol. II. p. 198.

Note 4.p.469. Art. Palais, Fig. 2. There remain only some parts of this portico.

Note 5.p.469. Art. Maison.

During the middle ages mansions often possessed internal p





internal porticos, that served to shelter persons awaiting introduction into the apartments, under which the servants remained, and where horses were sometimes fastened during the visits of the masters. Those porticos were only a gallery before the wall; for in our climate, porticos entirely open were not established, as practised in Italy. Air currents must be prevented. Those porticos of our old mansions are deep, relatively to their height and are closed at the ends.

The Mansion de la Tremoille at Paris (a mansion of which now remain only some fragments deposited at the Ecole des Beaux Arts) containing a charming portico attached to the facade on Rue de Bourdonnais. This portico was vaulted and constructed with extraordinary boldness.<sup>1</sup> Exposed to the Southwest, it was closed at the ends and surmounted by a gallery. From the carriage doorway opening on the street one could penetrate directly under the portico; it was first necessary to enter the court. That arrangement, which we saw adopted several years earlier in the Mansion of Jacques Coeur, was good in that it allowed persons walking under the portico not to be interrupted by arrivals or departures, and not to be inconvenienced by the currents of air so common in our pretended classical porticos. Lords and citizens of the middle ages did not think a cold worth a monumental arrangement imitated from the Greeks or Romans. For them the portico was a gallery open on one side, deep and relatively low, closed at least at one end, sometimes returned to benefit by a more favorable exposure. Thus at the castle of Pierrefonds, along the great hall existed a low portico, a mezzanine and closed at the ends, exposed to the east, and thus being in all seasons a covered walk well sheltered from bad winds, perfectly dry and sanitary, glazed in the mezzanine, and furnishing for the entire length of the great hall in the ground story an enclosed balcony opening into that hall. Thus in the residences of the epoch of the Renaissance we still see porticos closed at the ends and perfectly orientated. Such were the porticos of the chateau of Madrid, in the Bois de Boulogne;<sup>1</sup> such are still standing, the porticos of the chateaus of Chambord and Blois, and of some houses of Orleans.<sup>2</sup> These tend to prove that our ancestors feared colds, and thought that a covered walk must be a shelter for the walkers.





Note 1.p.470. See *Architecture civile et domestique* of MM. Verdier et Gattois. Vol. II.

Note 1.p.471. See plan and elevation of chateau of Madrid in Vol. I of *Entretiens sur l'Architecture*.

Note 2.p.471. Among others, that of Agnes Sorel.

#### POT. Pot. Vase.

The architects of the middle ages sometimes placed acoustic pots of terra cotta in the surfaces of the walls inside religious edifices, probably to increase the sonority of the interior. We have frequently proved the existence of those pots in the choirs of the 12<sup>th</sup> and 13<sup>th</sup> centuries. Several archaeologists have made the same observations. These pots are generally set in the masonry, only permitting to be seen the interior of their orifices in the face of the wall. They are placed at different heights and sometimes in quincunx form, but particularly near the corners. They exist in the square apse of the church of Monreale, in the church of S. Laurent in Gaux, at the abbey of Montevilliers, in the churches of Contremoulins near Becamp, and of Perruel near Periers-sur-Andelle. Normandy is perhaps the province in which this acoustic pottery has been most frequently employed to give sonority to choirs, but one also finds it in some monuments of Provence, and notably in the church of S. Blaise at Arles. In a Notice sur le couvent des Celestins de Metz, M. Bouteiller, member of the imperial Academy of Metz, cites a very curious passage of a chronicle of that monastery, written about the end of the 15<sup>th</sup> century, in which is a mention of this acoustic pottery. In the year 1432, page 133 of the manuscript one reads:--

"In this year aforesaid, on the vigil of the assumption of Our Lady in the month of August, after brother Ode le Roy, prior of the same, had from the chapter above, he order ed t to place pots in the choir of the said church, because he had seen them elsewhere in some churches, and thinking that it w would resound more strongly there. And there were placed in o oue day so many as sufficed. But I do not know if they sung better than before. And it is to be believed, that the walls were much weakened by them, and many persons that came within marvelled much that it should be so. And they said once that it would be better to take them away and play for the pleasure





of fools."

Note 1.p.472. See *Annales archæologiques*. Vol. XXII, p. 294, the article by M. Didron on acoustic pottery.

Efficient or not, it is certain that this method of sonority was accepted during the middle ages. Also sometimes, notably in the church of Montreal cited above, acoustic pots were embedded in the spandrels of vaults, the orifices of the pots being turned toward the interior.

M. Mandelgreen, a Swedish archaeologist, who has published a very curious work on Scandinavian monuments of the middle ages, stated that in most of the churches drawn by him, a great number of these pots were embedded in the walls and vaults, both in Sweden and in Denmark. Is that an antique or Scandinavian tradition, since one finds a quantity of those pots in Normandy? We shall refrain from deciding the question. In Russia many churches in the Pseudo-Byzantine style likewise possess acoustic pots. Was that custom transmitted to Russia by the Greek Byzantines?

#### POTEAU. Post.

A wooden timber set vertically and supporting girders, beams and sometimes facades or floors.

Wooden structures, so frequently employed during the middle ages, required the use of posts to support half timber walls, floors, sheds, etc. Those posts remained visible, for the architects of the middle ages had right ideas and never covered timbers with coatings or stucco, that rapidly destroy them. Leaving them visible, they fashioned them carefully, chamfered their angles, if within reach of the hand, not to injure persons, and to prevent injury to these angles. Many of our houses and our halls of the 15th century still have isolated posts, wrought with care and sometimes decorated by carving. But one can cite as a type of those pieces of carpentry the posts that support the floor and roofs of the custom house of Constance; thus we do not hesitate to give them here as a summary of what carpentry has done as most complete and best understood of that kind. The custom house of Constance was erected in 1383. It consists of a ground story and a second story covered by an enormous roof. The floor and roof are supported in the interior by two rows of posts arranged thus (Fig.1).





On a layer of sandstone A rises the lower post of elm, no less than 3.25 ft. square at base and cap, so that as indicated by the section B, each of those posts must have been cut from a tree 4.9 ft. diameter, free from sap. The head of the post is cut forked and receives the first cap C and two superposed beams, on which rest the joists. On the head of the lower post rests a second layer of sandstone D serving as a plinth for the second post E, which bears the carpentry of a second floor under the roof. The upper post is lighter than the lower one, but is also cut with a fork, and receives a cap and two superposed beams. Fig. 2 gives at A in cross section the upper post with its cap and its beams at B, these being assumed to be removed at C, and the fork of the head being then visible. At D is a perspective sketch of that assemblage of carpentry; at E is the cap detached, with its thinner part F entering the fork of the head. At G is sketched the lower stop of the chamfer with the moulding, at I the semicircular panels of the base and cap. Those upper posts as well as all the caps, girders and joists are of fir and are framed with the greatest care. But what is surprising in this work is the fine quality of the timbers and their perfect preservation. That timbers of such great dimensions can suffer the variations of temperature without cracking, it was necessary for them to be deprived of their sap by some means, and stored for a very long time before their use. The same observation can be applied to the posts of our houses and halls for four hundred years. It is very rare to find a crack in those timbers.

Note 1.p.475. Arts. Charpente, Maison, Pan de bois.

One understands by a corner post a vertical timber, that forms the angle of two timber frames at a right angle, and into which are framed the girts. Corner posts should be made of a single timber, so far as possible, so as to offer perfect rigidity. The timber A, Fig. 3, is a corner post. Rests and mortises receive the ends of the girts of the floors. These corner posts are generally fashioned from the most beautiful and soundest timbers. We have shown several of these pieces of carpentry in Arts. Maison and Pan de Bois; thus it seems useless to extend further on their function and form. Well wrought corner posts are still seen on some houses of Rouen, Chartres, Beauvais, Rheims, Orleans and Sens. There still exists





one representing a tree of Jesse at the corner of a house of Rue S. Denis at Paris, which dates from the beginning of the 16<sup>th</sup> century. Sometimes, particularly in the castles of the 13<sup>th</sup> and 14<sup>th</sup> centuries, the joists of the floors do not rest in the walls but on heavy beams supported at distances by posts set against the internal surfaces of these walls. This was a means of avoiding decay, that too frequently showed itself in the ends of joists entering masonry, and permitted the erection of those walls without the care for anchoring the joists. Thus the building was covered and the floors were laid without allowing them to be wetted, which is an important point, if one desires to avoid deterioration and cracks. The posts set against the walls also had the advantage of allowing the attachment of the wainscot and hangings, leaving them detached, very favorable to their perfect preservation. Besides, if desired to inhabit these castles with walls frequently more 6.6 ft. thick, only after the masonry had dried, it would have been necessary to wait several years. The space left between the walls and woodwork or hangings allowed one to install himself in those habitations without having to fear the dangerous effects on the health produced by the fresh masonry. Thus there were several good reasons for placing the floors on posts set against the wall, and we recommend this method to architects that build country houses, where area is not to be economized as in the great cities. The use of these posts against walls causes in many of our castles, that one perceives no trace of the floors separating the stories, although these are marked by doors and windows. Headers also frequently bore ties or braces to relieve the beams. The wainscot often covered these supports to the tops, and thus there became the origin of the coves of ceilings, that we see persist until during the last century. (13<sup>th</sup>).

POTELET. Small post. Stud.

This name is habitually given to the small vertical timbers that support the sills of windows in half timber frames above the bottom sills. These timbers were often wrought during the 15<sup>th</sup> and 16<sup>th</sup> centuries. (Art. Maison).





## POUTRE. Girder. Beam.

A timber placed horizontally and of large size, that serves to reduce the span of joists of floors. For more than 200 years, in order not to lose space in height of houses and palaces, girders have no longer employed, and the floors are constructed by means of headers, tail joists and joists, all timbers being set in one plane, so as to be able to lath and plaster the ceiling, but formerly and still in most French provinces, the joists are placed on beams relieved by corbels at their ends. (Art. Plafond).

## PRISON. Prison. Cell. Dungeon.

Castles, abbeys, episcopal palaces, city towers and chapters, possessed prisons within their walls during the middle ages; these prisons were merely cells arranged more or less well, dungeons or even inverted cones. The middle ages did not have to erect special establishments intended for prisoners, establishments that could only exist in a state in which the exercise of justice is centralized. It is unnecessary to state that prisons constructed in our old edifices are not marked by those careful measures, sanitary arrangements, and that well intended system of oversight, that today place these establishments in the class of complete and wisely designed edifices. Still the number and horror of these places of confinement during the middle ages have been much exaggerated. There still exist at the castle of roches very authentic prisons, that are nothing more than grated rooms, also sanitary and sufficiently lighted. Such are likewise seen at the abbey of Mt. S. Michel-en-Mer, also at the keep of Vincennes, and in most of our old fortresses, which differ from the chambers reserved for the inhabitants only by the scarcity of exits and the bareness of the walls. There is no need of being well versed in the history of those times, to recognize that prisons were necessary in every feudal domain, but we should state that very few of these terrible death cells ("Gô in peace") appear to have been occupied, while the cells, that were only well fastened chambers, were often filled. It seems that what was most to be feared by the prisoners of the king or lords, were the exactions of the jailers, and we take for proof this passage from the Apparicion de maitre Jehan de Meun:--

the Society of French Scientists, 1901. (14th century).  
The following is a list of the names of the members of the Society of French Scientists, 1901.

1. The first name is...  
2. The second name is...  
3. The third name is...  
4. The fourth name is...  
5. The fifth name is...  
6. The sixth name is...  
7. The seventh name is...  
8. The eighth name is...  
9. The ninth name is...  
10. The tenth name is...  
11. The eleventh name is...  
12. The twelfth name is...  
13. The thirteenth name is...  
14. The fourteenth name is...  
15. The fifteenth name is...  
16. The sixteenth name is...  
17. The seventeenth name is...  
18. The eighteenth name is...  
19. The nineteenth name is...  
20. The twentieth name is...  
21. The twenty-first name is...  
22. The twenty-second name is...  
23. The twenty-third name is...  
24. The twenty-fourth name is...  
25. The twenty-fifth name is...  
26. The twenty-sixth name is...  
27. The twenty-seventh name is...  
28. The twenty-eighth name is...  
29. The twenty-ninth name is...  
30. The thirtieth name is...  
31. The thirty-first name is...  
32. The thirty-second name is...  
33. The thirty-third name is...  
34. The thirty-fourth name is...  
35. The thirty-fifth name is...  
36. The thirty-sixth name is...  
37. The thirty-seventh name is...  
38. The thirty-eighth name is...  
39. The thirty-ninth name is...  
40. The fortieth name is...  
41. The forty-first name is...  
42. The forty-second name is...  
43. The forty-third name is...  
44. The forty-fourth name is...  
45. The forty-fifth name is...  
46. The forty-sixth name is...  
47. The forty-seventh name is...  
48. The forty-eighth name is...  
49. The forty-ninth name is...  
50. The fiftieth name is...

A second volume of the Society of French Scientists, 1901, is also available. It contains the names of the members of the Society of French Scientists, 1901, and the names of the members of the Society of French Scientists, 1902.



(Old French poem.).<sup>1</sup>

Note 1.p.478. L'Apparicion de Jehan de Meun, published by the Society of French Bibliophiles. p. 35. (14 th century).

And further:-- (Old French poem).<sup>2</sup>

Note 2.p.478. The same p. 54.

If the jails were farmed out, it is clear that the prisoners had everything to fear from their jailers; but this is outside our subject. The cells grouped in the vicinity of a hall of justice are those evidently presenting most interest, and whose purpose cannot be doubted. Now there exists in the municipality of Sens a complete prison beside the hall of justice, where the accused were judged. That hall is situated in the ground story under the great hall of the synod; it is vaulted on a middle row of columns. The prison occupies about a quarter of the space, and is placed at the end of one of the two aisles. We give the plan. (Fig. 1). The entrance of the palace of the archbishop is at A and the court at B. The stairs C lead to the great hall in the second story. By the wicket D one enters the court room E. The wicket G gives admission to the cell H with a tunnel vault. At I is a slab pierced by a hole communicating with a privy vault, and an iron bar is fixed in the wall at a height of about 2.0 ft, intended for passing the chain that keeps the prisoner seated. A stone hood K prevents the prisoner from seeing the sky through the window L, very high above the floor, leaving him only a reflected light. But this cell presents one curious peculiarity; over the very low wicket G is a little stair that leads to a little cell placed over the office M, and which by a window is in communication with the cell H. Thus could be placed there either a guard or a person to gather the least words of the prisoner. From the place occupied by the latter, it was impossible to see the window of the little cell because of the hood that deflects the external light.

A second wicket N. gives admission to three cells, O, P, Q. The last was quite spacious and was furnished with a privy seat. The cell O does not seem to have been intended to confine a prisoner; it receives no light from the exterior, but its stone floor is pierced by the trap R opening into an oubliette, go in peace or paradise, as then said. At M is a privy opening directly into the court room by a door S. If we lift





the trap B and descend by means of a ladder or rope into the dungeon A, receiving air if not light by a sort of flue B. The privy vault of the prison being at C at the level of the dungeon, the prisoner had a privy seat raised several steps at D. We also found in that "paradise" a wooden wainscot placed in the corner near the ventilating flue to protect the prisoner from the dampness of the walls. On the fear that the unfortunate cast into this dungeon might seek to escape by piercing the walls of the vault, the thickets that extends along the stairs descending to the cellars of the municipality is covered outside by wide wide panels of iron placed inclined and thus holding together all the stones.

If this prison presents few traces of the sojourn of men, it is not so with the cells of the ground story, that and especially cell H are literally covered by engravings and rude sculptures dating from the 13<sup>th</sup>, 14<sup>th</sup> and 15<sup>th</sup> centuries. There is seen a crucifixion, a tournament, inscriptions and names, incised in the plaster coating; for these divisions and internal walls are of rubble covered by a thick coat of plaster.

We have nowhere found so complete an entirety of dungeons and prisons without suffering any modification since the epoch of their establishment.

This prison was built at the same time as the official building of Sens, and consequently dates from about the middle of the 13<sup>th</sup> century. All these vaults, including that of the lower dungeon, are tunnel vaults built of rubble. Only the vault of the privy vault is composed of parallel stone arches with intervals of rubble laid on the extradoses of those arches.

The prisons of the castles are not generally grouped, but are separated from each other. Many towers of castles contain cells; but we know of none presenting so many and so beautiful (if this term can be applied to a cell) as the castle of Pierrefonds. In that residence a luxury of space extends even into those cells. Of eight towers, four possess two stories of dungeons; one lighted and ventilated, the other absolutely deprived of light. Fig. 3. gives the plan of one of those towers (that at the northeast) at the level of the upper cell situated below the ground of the court, but much above the external covered way. One descends to this cell by the screw stairs. It is circular with a diameter of 13.1 ft. Two doors close the corridor





B. It receives light and air by two slots C, and is furnished with a privy vault D. At the centre of this circular room is arranged a trap opening at the centre of the vault covering the dungeon absolutely closed, but likewise supplied with a privy. Fig. 4 gives the section of these two rooms. <sup>1</sup> One sees in this Fig. that the upper cell is spacious, abundantly lighted, ventilated and perfectly sanitary. The vault is composed of 6 pointed arches and is 3.9 ft. thick, to prevent any attempt to communicate with the prisoners; the hall A was on the level of the court and was intended for habitation. This section shows the lower dungeon, whose floor is on the level of the external covered way O. One can descend into this dungeon only by the orifice pierced in the vault, which was closed by a stone plug and a locked bar. The unfortunates shut up in that sort of stone bell did not have to fear dampness, for the walls are perfectly dry, but received neither air nor light from the exterior. The prodigious thickness of the walls and their actual construction could leave no chance to escape. One will observe that the vault of this dungeon is built of regular horizontal courses like all those of the castles and not of voussoirs. In one of these dungeons (that of the northeast tower) a crucifixion is rudely incised on the internal wall, the work of some prisoner who could only execute this work by feeling, and then two names and some formless outlines. In the dungeon of the middle tower (W), we discovered the skeleton of a woman crouching in the niche forming the privy. The construction of these lower stories is executed with <sup>as</sup> much care as that of the parts of the castle intended for habitation. The surfaces are admirably cut, and the beds have an irreproachable regularity. The southwest tower contains an oubliette at the middle of the lower dungeon. (Art. Oubliette).

Note .p.481. In this section we have made sections through the stairs, the passage and one of the slots, as well as through the privy and the lower vault.

We have likewise discovered low cells in the towers of the city of Carcassonne. One of these cells belonging to the old palace of the bishop had a pillar in the middle of the chamber with fetters attached to that pier, so that the prisoner could not reach the inside surfaces of the walls. Human bones were still held by the chain. Yet we should state that many





cell interiors do not appear to have been occupied. Some present no trace of a human being, and seem as left by the hands of the mason. Let us add that in the residences of the lords of the middle ages, the name of dungeon is often given to cellars intended to receive provisions. It is unnecessary to exaggerate the use of this means of repression, and in taking into account the customs of the time, one can even regard these prisons and dungeons as being established with regard to conditions of health, that have not always been observed during the last centuries.

#### PROFIL. Profile. Moulding. Outline.

Understood in architecture as the outline of a moulding. The profile of a cornice is the section perpendicular to the face of that cornice; the profile of the base of a column is the section normal to the curve of its circumference. To cut a moulding, cornice, belt or archivolt, the profile is given to the stonecutter. One cannot give the name of profile to the horizontal section of a pier or jamb; these are horizontal sections, plans and not profiles, for profile always denotes a vertical section or one normal to the curve of an arch.

Profiles are of major importance in architecture; they are expressions of the style, so to speak, and one of the most vivid expressions. The architectural styles regarded as art types have each possessed profiles, whose trace is derived from a principle essentially logical, and one can even say that only the styles of architecture that rise to the height of a superior art possess profiles. In fact, all architectural styles cannot be regarded as constituting an art. Some are merely a structure, others being only a mass of forms without logical sense. Without going outside the limits of this work, we cannot develop all the conditions, that tend to establish this distinction between the architectural styles attaining to art, and those which are only a confused expression of that need natural to man to ornament his dwellings or his monuments. It will suffice for us to state that profiles have a definite signification only among peoples basing every expression of thought on logic. The Greeks of antiquity were the first to give to the profiles of architecture a form derived from reasoning applied to the object. Before them, architecture





among Egyptians, for example, and properly speaking, did not possess profiles traced because of the object and the material. Among the Egyptians, profiles are very rare and are only of one hieratic form; they are based on tradition and not on reasoning. Already among the Ionians the profile is an expression. Among the Dorians it is drawn to satisfy a material necessity and with a view to produce a harmonious effect; it has its own laws and is not the result of a caprice. Thus dating from the complete development of Greek architecture, the profiles belonging to the architecture of the western peoples have their periods, that permit them to be classified in a systematic order. A profile of the brilliant Grecian epoch is recognized at first sight, without its being necessary to know to what monument it belongs. It is the same with the Roman profile of the empire, the Byzantine profile, the Romanesque profiles of the West, and the Gothic profiles. Certain profiles belonging to very different architectural styles can have, and in fact have had singular analogies; thus are established relations between the lines of Grecian profiles and those of profiles employed in the 12th century in the West. On the contrary, architectural styles very near each other present profiles drawn on principles absolutely foreign to each other. There is no analogy between the profiles of the Romanesque schools that ended in the 12th century and the profiles of that arising in Isle-de-France about 1160. The profile of the empire essentially differs from the Grecian moulding. The study of mouldings is therefore necessary: -- 1, to recognize the principles that have controlled the different styles of architecture; 2, to classify these styles and determine the dates of the monuments. From the moment that the monuments have been studied with some care, for example, it is easy to recognize that such a profile is only derived from such another, and that consequently it is later than it; that a certain profile belongs to an art that rises or that tends to its decline.

In every profile are two elements, utility and the more or less true feeling of form and for the effect that form should produce. Feeling is here nothing but the means of translating a need into an art form; but this feeling is itself subject to certain laws from which one cannot wayder, and whose importance can be appreciated at once.





What characterizes the profiles of the beautiful epochs of architecture is the true expression of the need that they must satisfy, and let us say, a distinction on their outline, that accen s them to the eye and engraves them in the memory. This distinction is derived from a sobiety of means, from the cho-ice in curvature anf a refined observation of the effects produced by light. There is a certain profile in the outline of which one can recognize the hand of a consummate artist, with a delicate mind, and a thoughtful and wise construction. No part of architecture is less subject to caprice or fancy than this, and one can say of the profile what is said of the style: - "that the profile is the architecture."

The Romans were little refined in the matter of art, and do not appear to have attached importance to the tracing of profiles, and if in some of their monuments of the commencement of the empire, one notes the intervention of a certain taste in these architectural details, it is necessary to thank for this the Greek artists that labored for them. It is even already shown that the profiles reproduce only the hollowed curves, copies executed with more or le s care, but which are only a sort of exaggeration adopted among Greek and Etruscan peoples, evidently types whose origin and reason of existence therefore have been lost. At the end of the empire the execution is defective, and the profiles are softened and heavy, seeming to be traced by chance or left to workmen that daily weaken the primitive types, and absolutely lacking character; they are recognizable only by even the negligence of their drawing and execution. We do not speak of the mouldings, also rare, that one can observe in the monuments of the primitive Romanesque epoch, the last weakened reflection of the Roman decadence. It is only at about the end of the 11 th century, when architecture tends to free itself from the corrupt traditions and to seek new ways, that one can verify in the mode of tracing the mouldings certain methods borrowed from Byzantine art, t the only one to which one could then have recourse. Yet these borrowings are not made in the same manner over the area of existing France. Schools already appear, and each of them proceeds differently in the manner of interpreting the profiles of Byzantine architecture, as in the mode of interpreting the local Roman traditions. Thus for example, if the people of





Perigieux built after the end of the 10 th century their Byzantine church according to the plan and general principles, & they retained in the edifice the profiles of the Roman decadence; the soil of Vesonne at that epoch being covered by Gallo-Roman edifices. If the architects of Berry and upper Poitou at the beginning of the 12 th century retained in the arrangement of the plans and the general ideas of their edifices the Roman traditions of the empire, their profiles are evidently borrowed from the Greco-Roman architecture of Syria. In Provence, on the banks of the Rhone, from Lyons to Arles, the profiles of the Romanesque period seem traced from those of the Byzantines. In Auvergne is established in architecture a sort of compromise between the mouldings of the Gallo-Roman monuments and those brought from the East. In Burgundy the edifices are generally built of hard stones of large dimensions, and during the 12 th century have an amplitude and power, that one does not find in Isle-de-France and Normandy, where men built them with soft materials; yet in spite of the difference between the schools, one recognizes at first sight a profile of the 12 th century among those earlier or later than that epoch. The characters belonging to the time, if possible, are still more decisive during the 13 th, 14 th and 15 th centuries, although certain schools persist. Those facts can be explained thus:- for the profiles there is a principle that controls their form by periods independently of the schools; then there is the last feeling dependent on the school.

It is a general law that governs even at first the tracing of the profiles of the architecture of the middle ages, This law is very wise; it requires that every profile be made within the height of a course. Compelled to submit to this, the architect draws his profiles at the scale of the structure, and not according to a conventional scale and a module. For example, it results that if two edifices are built with materials of a given dimension between beds, one having 32.8 ft in height and the other 98.4 ft., the cornice of the first will be very nearly of the same dimensions as the cornice of the second, i.e., these two cornices will be taken in one course of the same heights. In that the profiles of the architecture of the middle ages differ in principle from the profiles of Greek and Roman architecture. During the middle ages the pro-





profile is at the scale of the structure, like architecture itself. Because the use of the orders and of the module, the architects of Grecian and Roman antiquity must necessarily trace their profiles according to a relation to proportions of an order, without taking into account the dimensions of the materials; thus we see that in the same country, if they can profile a cornice of a little Corinthian order in a single course, passing to a great Corinthian order, they will profile its cornice in two or three courses. Proceeding from a different principle, the architect of the middle ages will give grandeur to a profile, not by means of the enlargement of a drawing, but the adoption of a different drawing. Thus for example, having to place two bands on the surfaces of a great and a small edifice, he will, if the materials require it, give the same height to the two bands, but he will trace the band of the large monument according to the profile A, and that of the little monument according to the profile B. Profile A appears stronger, more accented and at larger scale than profile B. In the adoption of this new principle, there was ample material for the observations of the artist, the subject of a very delicate study of effects; and if the architect of the late empire, having given the principal dimensions of an order, could no longer have to be anxious concerning the profiles of that order, it was not allowable for the architect of the middle ages to leave to the workman the care of tracing the profiles of his monument, since it was by this trace that he could give the scale of the whole. This being so, one comprehends how architects accustomed to regard the profiles only as an elastic trace, which diminishes or increases by reason of dimensions given to the entirety, could affirm that the profiles belonging to the western monuments of the middle ages were due to chance. But this is a language necessary to be known, a language that has its perfectly defined laws.

Profiles have two reasons for existing; the first responds simply to a necessity of the construction; the second is derived from pure art. It is clear that an external profile of a cornice is destined to throw the rainwater away from the surface that it covers; that a profile of a substructure is nothing but a footing to give a bearing to the lower part of a wall or pier. But it does not suffice to fulfil these functions, it

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is also necessary for the eye to find in the curve of these profiles a striking expression of their utility.

The profile of the Grecian Doric capital is admirably drawn to express support; and if the architect of the middle ages had anything to reproach it with, this is not to bear a load in proportion to its robust curve, since being corbelled on two sides, this capital supports nothing. It is the rigorous expression of a need, to which the architects of the middle ages first applied themselves in tracing their profiles; the need of being satisfied, they sought to render the expression sensible to the least experienced eyes, and it must be recognized that they had succeeded in it much better than did the architects of antiquity, including the Greeks. An error too widely diffused is to believe that a profile is beautiful in itself, and this error seems to have been shared by the Greek architects and those of the Romans during the empire. A profile has only a relative value, and what produces a satisfactory effect here will be injurious elsewhere. For example, the architects of the 13<sup>th</sup> and 14<sup>th</sup> centuries <sup>never</sup> gave to the internal and external profiles of the same edifice the same curvature for the reasons:— 1, that the needs they must satisfy externally and internally differed; 2, that the effects produced by direct light cannot be the same as those produced by diffused light. A profile lighted from above downward by the sun or from beneath upward by reflection, is modified to the eyes; then art intervenes, based on refined observations.

The earliest profiles that we observe in the primitive edifices of the middle ages in France, and particularly in Isle-de-France, Valois, a part of Champagne, Burgundy, Nivernais and Auvergne, if adapted to bands, cornices, rounds and abacuses of capitals, consist in a simple plane or bevel (Fig. 2) starting from the face of the wall or resting on corbels. But one soon recognizes:— 1, that these profiles do not protect the surfaces from rainwater; 2, that they produce little effect; for if the solar ray be above the line a b, all the beveled portion c b is sunk in the shadow, if the solar ray be the line c d, the bevel c b is in the light and is almost confused with the fillet d c. From the beginning of the 11<sup>th</sup> century, men sought to obtain more relief or more effect by cutting a groove o above the large bevel (Fig. 3). Thus when the solar





ray was in the prolongation of the bevel or even above it, then they obtained a luminous stripe between the fillet and this bevel; then to avoid the flow of the rainwater, a drip g was cut below the bevel. The bevel was then included between two grooves more or less deep, which accented the half light generally diffused over this inclined plane and gave relief to the profile. Then to slightly hollow the bevel in the form of a cavetto requires but small effort, though the result obtained is relatively considerable. In fact, (Fig. 4) by assuming the solar ray in the direction of the dotted lines, beneath the upper fillet is obtained a vivid shadow and then a light a; below that luminous line is a shadow b with reflections a and consequently soft; then a luminous line c slightly veiled by a half tint; then the cast shadow d. However high is the sun, the luminous line a always appears, and the great cavetto is at least modeled by a reflection, even if it does not receive light on its lower portion. However low is the sun, there is always a strip of shadow above a and a half tint at b. By this procedure with a small projection, the designer produced an effect of relief greater than in the preceding example.

These great cavettos soon appear soft, the slope is divided into several members as seen in Fig. 5, giving the profile of the abacuses of the capitals of the porch of the church of Creteil near Paris (second half of the 11 th century). By striking the moulded members in the plane of the bevel, the light produces a succession of shadows, half tints and lights, that give to such a flat profile a much greater value than it really has.

The architects of the 12 th century by their system of construction and the nature of the materials, that they use in the work, desiring to avoid great blocks, give but little projection to their external mouldings, but they seek by the section to supplement that lack of relief, and thus they obtain remarkable results. When one draws the monuments of that epoch, he cannot believe that such clear, lively and sharp effects can be obtained by the aid of profiles with such slight relief. For example, the profiles of the old tower of the cathedral of Chartres, although belonging to a colossal monument, have scarcely perceptible, though visible afar, and fulfil their object in a manner absolutely satisfactory. But the external





mouldings of that period are rarely drawn with a view to throw off rainwater; the artists who gave them the curvature appear to be especially occupied with the architectural effect, with the direction of the lights and shadows. They have only observed that on the surface, a series of shadows give it importance by compelling the eye to stop there.

The architects of the middle of the 12 th century were certainly most skilful tracers of profiles with small projections in the work. They adopted the accentuations, if one may so express it. In the words of the language, the accent falls on one syllable. If the word is composed of two syllables in French, it is on the first with some rare exceptions; if composed of three syllables, it is on the first or second; if of four, on the last or next to the last. In the old French, that concerns the language of oc or that of oil, the accent is perfectly regular; it is the accenting that even invariably indicates the etymology. Well, in the drawing of profiles of the last Romanesque period, in the epoch when the architecture was being made, like languages, the accentuation is always marked. A profile thus becomes like a word; instead of being composed of syllables, it is composed of distinct members and its accentuation is regulated. But the commencement of a profile is according to its position; if the profile is a base or socle, its beginning is at the upper part that first supports; if the profile is a band or a cornice, its beginning or first member is at the lowest point, that starts from the front of a surface. Thus (Fig. 6) here at A and B are two base<sup>1</sup> projections, each composed of three members; the accent is on the second member, and that accent is marked by the strong shadow projected on the scotia at a. One even notes that to accent this second member more, the scotia in profile A has been fluted.

Note 1.p.490. Profile A comes from the portal of Notre Dame of Chartres, 12 th century; profile B is from the old tower of the same church.

At C and D are traced two profiles of bands and abacuses; <sup>2</sup> the first member is at the bottom, and the accent on these two profiles, one composed of three and the other of two members, is on the first member,<sup>an</sup> accent indicated by the strong shadow projected at b. In the example of Fig. 5, the profile (we use the word) is not yet formed, and the accenting is vague. In





the formation of words, French has habitually proceeded by contraction, always retaining the syllable on which is placed the accent. From *dominus* it made *dom*; and of *vice-dominus*, *vidam*; of *dominarum*, *donger*, *dangier* and *danger*; of *vassaletus*, *vaslet*, *varlet*; of *consobinus*, *cousin*; of *palus*, *peu*, then *pieu*; from the verb *cogitare*, *cuidier*; from *flebilis*, *fieble*, now *faible*; from *augurium*, *neur*, from which is *malheur*; from *ananae tela*, *arentele*, an old lost word that is much better than *toile d'araignee*; from *soror*, *suer* (pronounced *soeur*) to the subject; from *sororem*, *seror* to the rule, as *infans* gives *ense* to the subject, and *infantum*, *enfant* to the rule,<sup>1</sup> as *abbas* has given *abbe* in nominative; *abbatem*, *abbe* in the objective, etc. Now it is interesting to observe that in the composition of architectural profiles, the masters of the middle ages proceeded similarly by contraction and always retaining the accented member, omitting most of the others. Let us return to the examples given in Fig. 6. We see that the profiles of the base have retained the upper torus of the Roman base, that they have more strongly accented the scotia, and that they have weakened the lower torus by reducing its relief. The accentuation of the Roman profile was also most on the scotia.

Note 2.p.490. From the old tower of the cathedral of Chartres.

Note 1.p.491. Until the 13 th century the French language retains two cases; subjective and objective. (See *Histoire de la langue française* by M. Littré). Of these two cases, modern French has retained only the objective.

If opposite the profile D we place an analogous Roman profile, a profile E of a band or impost, we see that in the Roman profile the accented member is indeed e; the master of the middle ages in the band D has suppressed the member f, has placed the accent on the member e, but has singularly reduced the member g.

But during the 12 th century was produced in the art a work of transformation, in the language. Different influences acted; at first and in the first rank the Latin influence; then those from the Orient, which are also themselves in great part Latin; the profiles are contracted and the accentuation assumes more importance. Soon is mixed with this work of transformation a new element, the logical element; experiments and uncertainty disappear, and the lay masters introduce an enti-





entirely new system in tracing profiles. Yet however abrupt or profound the transformation, by the aid of analysis one can always recover the elements, that served to reproduce it. Let us in fact proceed by analysis, and we shall see how from Roman profiles the masters of the 12 th century came to trace a profile, that seems no longer to retain anything of its origin.

In every work in analysis, it is necessary to know the primitive elements. The architects of the middle ages at the epoch called Romanesque could have only the elements in their hands. Those elements were the remains of Gallo-Roman edifices, and those brought from the East, mixtures of Grecian and Roman arts. Now only speaking of profiles, those elements being for the most part no longer constituted logically, could neither give imitations or furnish logical interpretations. There remains little more in the trace of the profiles of the Greco-Roman monuments of Syria, than a delicate feeling for effects, a marked accentuation, further very superior to all that was left by the Roman decadence in Italy and on the soil of Gaul. The prominent character of the Greek profile of the best time is the alternation of plane surfaces and of moulded surfaces, it first having a considerable relative importance, whether one regards the profile of entablature as derived from a wooden or a stone structure, the appearance of a squared timber or a block of stone dominates, and the mouldings only seem to cover the joints, to be transitions between plane vertical and horizontal surfaces. That was very logical, as we stated in the beginning of this Article; but the Romans, for whom art was scarcely expressed except by luxury, profusion and richness, must necessarily take that delicate sobriety for poverty; like all the architectural members, the entablatures were then covered by more developed mouldings, relatively to the plane surfaces, more numerous and frequently decorated by ornaments. It suffices to compare the profiles of Greek orders, Doric, Ionic and Corinthian, with those of some Roman orders from Augustus to Trajan, to prove that the latter add moulded members, or at least give them a much greater relative importance. Gradually the plane surfaces are stifled under the increasing development of the mouldings; so much so that at the end of the empire those plane surfaces have almost entirely disappe-





disappeared, and even the friezes are traced in curved lines. But still the Roman, who does not reason in the matter of art, retains all the members of the entablature, although that entablature has no reason for existence, for example, between the capital of a column and the arch or vault.

When the genius of the Greeks found itself in possession of the architecture and no longer had to submit to the Roman rule, it did not reject the elements of construction adopted by their ancient masters; on the contrary, it uses them, retains the arch and vault, but its logical spirit leads it to modify the entablature of the order in accordance with the new functions that it must satisfy. Even more, it adopts the arch on the column, entirely suppresses the entablature, and as in the Romano-Greek edifices of Syria, the Greek often rejects the placing of a platband on the column, henceforth separating those two members previously united; separating them, he made of the new entablature a contraction of the antique entablature. All know that the Greek entablature, and consequently the Roman entablature placed on an order, consists of the architrave, formerly called the lintel, extending from one column to the next, of the frieze that gains the depth required to receive the internal ceiling, and of the projecting cornice, that shelters the whole. To this rule are few exceptions until the end of the empire, so that the entablature is a part of the order. The Romans were bad logicians in the matter of art, and placed a complete entablature to crown an edifice, even when there was neither an order of columns or of pilasters under it. Yet if these three members were perfectly justified when necessary to span an intercolumniation, they have no reason to exist when the column is absent; then the cornice alone should suffice. The Greeks of Syria reasoned thus. At the tops of their monuments, in which the column no longer has any function except to support arches or the lintels of galleries, the antique entablature is contracted. The frieze<sup>1</sup> (Fig. 7) is only indicated by the great torus *a*, it is confused with the architrave *A*, and the cornice *B* alone remains entire. The architrave itself almost entirely loses its vertical planes. Thus the new method of profiling the entablature appears. Not being associated with the order, it tends to escape from the rules imposed by the construction of the order. In monuments





of small dimensions like tombs, the entablature abandons all traditions, and it is traced according to a new and rational method (Fig. 8). The corona is independent of the lower mouldings and is beveled; it is a shelter, the gutter of a roof, and the moulding supporting it is merely a corbelling intended to prevent the overturning of the projecting portion. These profiles, that come from the monuments of the 5<sup>th</sup> century, drawn by count de Vogue and G. Duthoit between Antioch and Aleppo, will furnish us with starting points for our Romanesque profiles of the 12<sup>th</sup> century. In fact (Fig. 9), placing in parallel some of these profiles of <sup>the</sup> Romano-Greek architecture of Syria with those of France, we shall recognize perfectly that the latter are inspired by the former, but the French artists have proceeded by contraction, according to their methods. The profiles A come from bases, those at B from socles, those at D from lintels and bands belonging to the monuments of northern Syria. Now profiles A' are from bases, those at B' are from socles, and those at D' from bases belonging to the nave of the church of Vezelay, which dates from the first years of the 12<sup>th</sup> century. The analogy between the methods of tracing these profiles is striking; but the Cluniac profiles of Vezelay are all more or less contracted, although the accenting in each one is sensible. Thus in the profiles of b bases, the accenting is invariably on the scotia a, as in profiles and socles on the first member and in bands on the first lower member e.

Note 1.p.493. From the great tomb of Xherbet Boss.

If in Romano-Greek profiles the plane surfaces have almost entirely disappeared between the moulded members, they no longer exist in the profiles of Vezelay, or are reduced to fillets of little width. In fact in a transformation preceding by contraction, for example, the surfaces g must first disappear; but also as the profile contracts, the accenting assumes more importance, and in fact the French profiles appear more accented than those from which they are derived. If one finds exceptions to this rule of accentuation, this is at the moment when Romanesque architecture tends to transform itself anew and to give place to the style called Gothic. Then sometimes as in example C, taken from a base of the columns of the sanctuary of the church of Vezelay (end of the 12<sup>th</sup> century), t





there is experiment and uncertainty. This transitory state only lasts an instant, for in construction of that sanctuary, except these bases that naturally must have been cut and set first, all other profiles evidence a very free art and a tracing of profiles based on new principles.

These transformations by contraction do not cease to be produced in the trace of profiles of the 12 th to the end of the 13 th centuries. Thus, to give here only a very apparent example, this (Fig. 10) is a trace of the band A, very frequently employed in the edifices of the middle of the 12 th century, like the church of S. Denis, and cathedral of Noyon, the church of S. Martin of Laon, etc. The profile A is taken within the angle a b c and consists of a wash a e, a groove f, a wide cavetto g, and a groove h. The round with its torus o is the accented member. Observing that this profile is not of a nature to throw off the water from a e, the architect of the beginning of the 12 th century, while retaining the same projection given by blocking out, traces the profile B. He sensibly increases the upper inclination, makes a square return, cuts at l a pronounced drip to reject the rainwater, and contracts the lower profile. A little later, the architect still increases the inclination and retains the drip (see trace D), and contracts more the lower moulding while leaving to it only its accentuation, the round m. About the end of the 13 th century, the designer again increases the inclination (see trace E) and retains only the drip, which is confused with the old cavetto g. Of the source in these remains only the fillet o. Thus from the Romanesque profile derived from a foreign art, the Gothic architect by a series of logical deductions has obtained a section very different from that serving as the starting point. By gradually increasing the inclination of the upper member of this profile, terminating that slope by a corona very differently accented from the antique corona, contracting the lower moulding, even to suppress it entirely, the designer of the school of the 13 th century has made a useful member of the band with no decorative signification, a means of throwing rainwater from the surfaces, without having to fear even the effect of its rebounding from a horizontal or slightly inclined surface.

Yet if it concerns the crowning of an important edifice, a





pronounced projection is required. A single course cannot suffice; the architect of the growing lay school always proceeds by contraction. From the profile of the Romano-Greek cornice became the Romanesque profile, he takes only the rudiments. In the example of Fig. 7, we have seen that the members of an antique architecture are nearly complete. The two faces b, d, although much reduced, still remain; by compensation, the upper profile c is developed at the expense of these faces. The frieze a is only a round crushed between the cornice a and the architrave. The designer of the end of the 12<sup>th</sup> century (Fig. 11),<sup>1</sup> suppresses the frieze, whose existence is still suspected in some monuments of Romanesque architecture; of the architrave he retains only the developed member, abandoning the others, and of the cornice he makes only a corona, as in the preceding example.

Note 1.p.497. From the north transept of the cathedral of Noyon, about 1170.

Yet the Romanesque architects during the 11<sup>th</sup> and beginning of the 12<sup>th</sup> centuries habitually compose cornices with a series of corbels supporting a slab.<sup>2</sup> This mode is simple in construction and permits giving a very rich appearance to this architectural member at little cost. However numerous and well drawn are horizontal mouldings, they cannot produce this brilliant play of lights and shadows of the cornice with corbels. In the design of their crowning cornices, the architects of the beginning of the 13<sup>th</sup> century rejecting corbels, that are unsuitable for great monuments, and recognizing the insufficient effect of mouldings, even projecting and multiplied below the corona, made of the first course a great cavetto, that they decorated by large leaves or crockets,<sup>1</sup> and a corona of the second course. Until then the architects seem to have followed their feeling in the tracing of profiles, whether the effect or task indicated to them the need; they sought by empirical means, let us say, to profit by the light to give an expression to their profiles. However numerous may be the examples of Romanesque profiles that we have been able to collect and compare, we can subject them only to certain general principles, whose value we emphasize, but which are not derived from purely geometrical procedures. It is entirely otherwise when one takes up the architecture of the lay school of





the 13<sup>th</sup> century. Then geometry establishes itself as mistress, and the profiles thenceforth are traced according to fixed laws derived from angles and circles.

Note 2.p.497. Art. Corniche, Figs. 1, 2.

Note 1.p.498. Art. Corniche.

It is necessary for us to furnish here a number of examples to demonstrate the universality of these geometrical methods. We must restrict ourselves and choose those most apparent.

Let us take the crowning mouldings that externally take the place of the antique cornice, and that crown all arrangements of our buildings of the commencement of the 13<sup>th</sup> century. Those courses, of which Fig. 11 gives some of the first types, are drawn at certain angles. If very much inclined with the angle of the wash at  $60^\circ$  (Fig. 12, A), this is the side of an equilateral triangle (do not forget this point). the square part of the drip a, returned at a right angle, gives an angle of  $30^\circ$  with the horizon, The face d of the drip being determined according to the strength of the stone and the effect one desires to obtain. These faces being wider as the coronas is placed higher, one takes two thirds of that face, which being laid off on the line c d extended to b, gives the radius f d; the drip is traced thus. Erecting a vertical from the point f and tracing a horizontal from the point d, and from the point d of a line at  $45^\circ$  with the horizon, one obtains the point e, the centre of a circle with radius e g. Tracing a line e h at an angle of  $60^\circ$  from the point e, one obtains on the line d b the centre h of a circle with radius h i. Tracing a horizontal from the point h, and from the point k, the bottom edge of the profile, also tracing a line at  $30^\circ$  from the horizontal, one finds the point l, centre of a circle with radius l m. Thus the profile of the crowning mouldings as drawn, inscribed within the block c o k.

If the wash be less inclined, its slope is given by a line at an angle of  $45^\circ$  (see trace B); the face of the drip is therefore inclined at  $45^\circ$ . Taking two-thirds of this face as before, and transferring this length on the prolongation of the line c d, one obtains the point f. From this point draw a line at  $45^\circ$  and a vertical f p; from the intersection of this vertical with the arc of a circle drip d p, by drawing a line p s at  $45^\circ$ , one finds the point s, the centre of the circle with





radius  $s\ t$ . Drawing a line at  $45^\circ$  downward from this point  $t$ , and from the centre  $s$  a line at  $60^\circ$ , one obtains a point of intersection  $v$ , centre of a circle with radius  $v\ q$ . Drawing a horizontal from the centre  $v$ , dropping a vertical to the line  $c\ d$  prolonged, one finds  $x$ . From this point  $x$  by drawing a line at  $30^\circ$  to the horizon, one obtains by the intersection of this line with the horizontal a point  $y$ , centre of a circle with radius  $y\ n$ , and the cove  $z$  is a quadrant with centre at  $n$ .

If the wash be still less inclined, its slope is given by a line at an angle of  $30^\circ$  (see trace D). The face  $c\ f$  of the drip is consequently inclined at an angle of  $60^\circ$ . Drawing a horizontal from the point  $d$ , taking on the prolonged line  $c\ d$  one third the face of the drip, one obtains the point  $f$ . Drawing a line at  $30^\circ$  from this point, therefore perpendicular to the line  $c\ f$ , the intersection of this line with the horizontal gives the point  $g$ , centre of a circle with radius  $g\ h$ . From the centre  $g$  dropping a line at  $60^\circ$ , and a vertical from the tangent point  $o$ , one finds the intersection  $p$ , centre of a circle with radius  $p\ q$ . Drawing a horizontal from the centre  $p$ , the centre  $s$  of the last circle is placed on it, whose diameter is more or less great, according to whether one desires a more or less pronounced extreme case. For washes of small inclination, the drip is not generally traced as an arc of a circle, because this trace (as indicated at C) would not give an angle sufficiently pronounced to ensure a quick drop of the water.

In these three examples one will note that the most projecting profile is that of the crown moulding whose wash has the greatest inclination; this is that in fact these cornices are those placed at the base of great roofs and must support a wide gutter and sometimes even a balustrade. The pronounced inclination of the wash thus occupies small space. In the second example the cornice is made to leave above it only a narrow passage; thus the wash of the corona occupies space and the profile is less projecting. In the third, the wash of the corona joins an upper vertical face and it approaches the horizontal to not give too long a wash. For example, so are traced the washes of the cornices of the lower arrangement of the apse of Notre Dame of Rheims, that join the faces of the upper buttresses.

The first thing I noticed when I stepped out of the car was the cold. It was a sharp, biting cold that seemed to penetrate my coat. I shivered as I walked towards the building, my hands tucked into my pockets. The air was thick with the scent of coal and the distant hum of machinery. I had heard that the place was a maze of tunnels and underground workings, but I had no idea how cold it would be. The building itself was a massive, dark structure with a series of arched windows that looked like eyes staring out at the world. I hesitated for a moment before stepping inside, my breath visible in the cold air. The interior was a vast, open space with a high ceiling. The floor was made of polished stone, and the walls were covered in a network of pipes and conduits. The lighting was dim, with a few small lamps providing just enough light to see my way. I walked towards the back of the building, following a series of signs that led me to a large, open area. In the center of this area was a large, circular structure that looked like a giant's foot. It was made of a dark, metallic material and had a series of smaller, circular structures around it. I approached it with a sense of awe and wonder, my heart pounding in my chest. The structure was a marvel of engineering, a testament to the power of man and the mysteries of the earth.

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But these three mouldings surround a frieze with foliage, as around the choir of the great nave of Notre Dame of Paris. If those mouldings only form simple bands between two plane surfaces, if they do not fulfil the function of crowning, if they do not surmount a frieze, they have less projection and are generally very inclined., varying between  $50^{\circ}$  and  $70^{\circ}$ . (See the same Fig. 12). That given at G is traced by the following method:- the centres of the circles are placed on the horizontal lines drawn from the angles a and from that at b, and obtained by lines parallel to the verticals. If the band-corona has still less projection as at H, its drip is only a semicircle with centre placed on the prolongation of the lower face of the moulding. Also sometimes, as in the example given at P, the profile of the moulding consists of a cavetto and round. Either the cavetto is tangent to the round or the centre of this cavetto is raised to a, so as to give a fillet at g that separates the round. Then as one sees at i, a part of the circle is tangent to the two curves.

The preceding examples suffice to demonstrate:-1, that the profiles of the commencement of the 13<sup>th</sup> century are traced by means of parts of circles; 2, that the centres of the circles are given by geometrical methods principally consisting of intersections of horizontals, verticals, and lines inclined at  $30^{\circ}$ ,  $45^{\circ}$  and  $60^{\circ}$ . It does not result that all the profiles of the monuments of that epoch are identical, but they always proceed with the same methods. Thus, taking the great crowning cornice of the nave of the cathedral of Amiens in the parts not rebuilt, notably on the facade (primitive portion dating from about 1225), we find this trace. (Fig. 13 at A). Here the centre of the upper circle is obtained by laying off the width a b of the face of the drip from b to c on the line a b prolonged. The point c is the centre of the arc of the drip with radius c b. Drawing from the point l a vertical and a perpendicular to the line a c, (and which perpendicular gives an angle of  $45^{\circ}$  with the horizon), the intersection of that line with arc of the drip gives the point d, the centre of the circle with radius d e. The line d f at  $45^{\circ}$  intersects the lower edge of the profile. On this line is taken the centre g of the last circular member. The centre h of the cavetto is likewise taken on the line at  $45^{\circ}$  tangent to the upper circle; as





for the frieze with crockets and leaves that cover that moulding, it consists of an upper fillet, a wide hollow and a lower round. The centre of this round is placed on a line at  $45^\circ$  starting from the lower corner *m* of the profile. The width of the fillet *p* being known, the point *o* is joined to the centre of the round by a line, the length *o s* is divided in two parts by a perpendicular *k l*, on which is taken the centre of the great hollow. Here the centre of this hollow is taken on the intersection of this perpendicular with the vertical face line at *n*. If the hollow must be less concave, the centre is placed farther off; if more, it is placed nearer; but the point *v* never passes the face of the lower wall. This profile being given at  $1/6$  full size, one will note that the frieze is 2.0 ft. high, the moulding is 0.98 ft., and that the projection of the moulding is 1.08 ft. At the end of the 13<sup>th</sup> century, several parts of these mouldings were remade, and the profile was modified as indicated in sketch B. Our readers are sufficiently familiar now with the methods, so that it will not be necessary to explain that employed for drawing that profile. Yet one will observe that the system of contraction is always adopted, and that in this last profile the lower round member is replaced by a simple bevel.

Is there any need to emphasize the logical sense of these mouldings? Does not one see at the first glance that they are conceived as much to satisfy well marked needs in view of solidity of effect? Thus profiles are placed at great heights and present their mouldings to the eyes of the spectator; none lose importance by the effect of perspective, and none is diminished or masked by an adjacent member. For solidity (the first result obtained consisting in promptly throwing off rainwater), the architect has at once desired to restore strength to the stone by the adoption of this circular upper member. Thus he has been able to cut a gutter in the moulding. At the inner angle of the gutter is no weakening. Then in obtaining a play of light and shadow comes the intermediate cavetto, and the smaller lower round, but which suffices to stop the entirety of the profile. Below expand these great leaves and crockets in a wide hollow, that guides the eye from the strong projection of the moulding to the vertical face of the wall. The projection of these leaves and crockets arrests the lumi-





luminous rays under the wide and modeled shadow of the moulding.

This composition of a cornice nowise recalls the form of the Grecian or Roman antiquity, but it is beautiful, produces a grand effect, crowns the edifice admirably, and is wisely reasoned. What can it be reproached with? Originality?

It is to be desired that this same reproach could be addressed to our modern profiles.

About the commencement of the 14 th century, architecture tends to become lighter, the system of contraction still dominates, external cornices but rarely present two courses, the frieze disappears and is confused with the moulding. Thus in the same edifice, the north tower at Notre Dame of Amiens, that was only completed about 1225, has a cornice of a single course. (Fig. 14, A). Sculpture has left the frieze of the 13 th century to take refuge in the hollow B of the moulding; but since the drip of this moulding would have allowed the rainwater to run over the sculptures, the designer has added the counter moulding a, composed of a round terminating a slope. From the primitive moulding remains the face b, which gradually lessens to entirely disappear about the end of the 14 th century; but then to better discharge the water, the round has a drip c. In example A, the lower round is reduced in thickness, and it is surmounted by a fillet to stop the sculpture clearly. We find other profiles of mouldings of the same epoch without sculpture, whose mode of drawing is simplified as for example the moulding D. Men seek rapid methods and diminish the secondary members. Thus the great drip G, so frequently used during the 13 th century, is replaced by the lean cavetto H, if bands are necessary, intended to shelter the walls well.

Let us leave the external profiles to occupy ourselves with the traces and transformations of the internal profiles during the 12 th and 13 th centuries. We go back and analyze the profiles of the arches of vaults at the moment when the system of construction termed Gothic was adopted about 1140 in Isle-de-France. If there be today an uncontested fact, this is that the abbey church of S. Denis opens in the time of Suger the period of transformation of Romanesque architecture into architecture really French. In the 12 th century was definitely formed the French language, abandoning the rubbish of low Latinity, to compose a language henceforth having its own gram-





the grammar and syntax. It is also in the 12 th century that more or less complete decadence of Gallo-Roman traditions in architecture give place to a new art. The transformation is sensible in the constructions due to abbot Suger at S. Denis from 1140 to 1145. The system of Romanesque vaults gives place to an entirely new principle, which has analogies neither in antiquity nor in the Italy or Germany of the middle ages. We have emphasized the importance of this transformation in Art. construction. Henceforth Roman tunnel or cross vaults are replaced by cross vaults possessing principal, transverse, side and diagonal arches. These arches are already moulded at S. Denis, and present sections A for side arches, and B for diagonal arches. (Fig. 15). As for the transverse arches, they take the same profile as the side arches with a wide lower fillet. (The dotted line a b being the middle of the profile of those transverse arches).

These examples are furnished by the vaults of the chapels of the choir. In the north tower of this church, which dates from the same epoch, the diagonal arches already present an angle at the intrados, as indicated by the profile C. There is no longer anything in these profiles, that recalls the mouldings sometimes decorating the transverse arches of the Romanesque period. The designer evidently desires to obtain lightness, to diminish to the eye the strength of these arches, while accenting their curvature and their spirit by a certain number of cavettos. It is in fact an arch having much more resistance to the eyes, and appears to better fulfil its function as centering, as more numerous concentric lines accent its curvature.

About the same epoch the Cluniac school of Burgundy sought on its part to obtain the same result, but dared not free itself so completely from Romanesque traditions. In the chapter halls of Vezelay, whose construction dates back to about 1140, the transverse arches give the section E (the middle of the arch being the line c d), the diagonal arches the section F, and the side arches the section G, (Fig. 15); or again the transverse arches the section H (the middle of the arch being the line g h), the diagonal arches the section I, and the side arches the section K. These last examples accent the reminiscences of the Romanesque profiles, these profiles are beautiful.





and produce a beautiful effect, but do not have the freedom of the system already striking in the profiles of the abbey church of S. Denis. These are attempts, but not a fixed system.

At S. Denis, the architect regards the diagonal arch as a rib or round, and he traces a great round; for him the side arch is only an engaged transverse arch, and thus he takes the section of that transverse arch. He desires to lighten the diagonal arches and gives them small members; the transverse and side arches each have their distinct profiles.

The method does not exist, it cannot be followed according to a logical system. This is a matter of feeling and not of reasoning; the proof is that by taking ten Burgundian edifices of the same epoch, we shall find in each of them profiles of arches very skilfully traced and even very beautiful, but which open no natural path, that do not emphasize the intervention of a rigorous principle, fertile in deductions. On the contrary, the three or four profiles of the arches of the vaults of S. Denis, however simple they may be, and precisely because they are very simple, are indeed the beginning of a system from which men will no longer depart until the 15th century, extending it to the final consequences.

As always happens when at first is imposed a method, soon one tends to simplify the means. The architect of S. Denis, still near Romanesque forms, gives the diagonal arch and profile different from those of the transverse and side arches; yet he adopts the round or cylindrical form in tracing both (the profile of the transverse being the same as that of the side arch). But he soon recognizes that the arch that should appear lightest to the eye, the diagonal arch, composed of a great round is heavy, and seems to offer more resistance than the transverse arch with two rounds of less diameter, made in the two angles of the intrados. Some years later, about 1165, the architect of the cathedral of Paris frankly adopts the consequences of the accepted method. The section of the transverse, diagonal and side arches being given, he subjects these three arches to the same system of profiles, causing their more or less light appearance to be derived from the differences given by the sections. Thus (Fig. 16) A being the transverse, B the diagonal and C the side arch, the mode of tracing the profiles is the same for all three. In rectangular intrados,





he forms at each angle a round of 3.9 to 4.7 ins. diameter; d dropping from the centre a a perpendicular on the intrados, he obtains the point b, centre of the circular arc of which b c is radius = 3.2 ins. From the point d, the intersection of the line g d at  $45^{\circ}$  with the circle, he draws the line d e at  $45^{\circ}$ . He erects from the centre the perpendicular a f to avoid reductions, as he has traced the horizontal line a i from the same centre to cut the acute angle formed by the intersection of the two parts of the circle. The same trace is adopted for the three arches, as indicated by our Fig. 16. Besides the advantage of simplicity, this procedure has another merit; the members of the mouldings being the same for the three arches of a vault, give the scale, i.e., cause the different arches to appear with the ratio of strengths, that then really have with each other.

No architect, however unfamiliar with practice, is ignorant that it is easy to give an architectural member the appearance more or less strong by the mouldings that decorate it. The arches each having their true and necessary dimensions, adopting the same moulding for all, those arches present to the eyes the appearance of their real strength; and that strength being in exact proportion to the functions of those arches, it resulted that the eye was satisfied, as far as the stability was concerned. Then the system of Gothic vaults being adopted, the side arches did not have the span of the transverse arches, since the vaults were cross vaults, and the side arches had only half the span of the transverse arches; further the side arches were only a trace of the vault along the wall, and had no load to support; it was natural to give them only the section of half a diagonal arch.

Let us see how at the same time the architects proceeded in the province, in which the system of construction called Gothic arrived in the state of an importation. The choir of the abbey church of Vezelay was built a little after that of Notre Dame, i.e., about 1190; there in the drawing of arches of vaults, experiments are still apparent; the methods are not frank and certain as at Paris. It suffices for convincing one's self of this to glance at Fig. 17, which gives at A two transverse arches of the chapels of the choir, and at B a diagonal arch of the same chapels. <sup>1</sup>





Note 1.p.508. All these profiles are drawn at 1/10 full size.

These sketches indicate a refined feeling for effect (the three arches produce much); but method is absent. The two diagonal arches from the high vaults of the choir (for as in many great vaults of the end of the 12 th century, the diagonal and transverse arches give the same section), sketched at D, indicate a more complete study of the architecture in Isle-de-France, and nearly reproduce the profiles of the vaults of Notre Dame of Paris. But these vaults in fact were erected some years after those of the chapels, and the experiments have nearly disappeared. There is manifested in the last profiles a tendency that belongs to the Burgundian Gothic school; this is the predominance of the curves over the straight lines in the trace of the mouldings. The nature of the materials employed was indeed for something in that predominance of the curves, but also the taste of this school for breadth of forms. While the Romanesque architects of Isle-de-France, Berry, Poitou, Saintonge and Provence cut fine profiles detailed to excess, those of Burgundy already traced profiles of an extraordinary breadth and boldness of curvature. In adopting the system of Gothic construction, the architects of the Burgundian school retained that native quality. We shall soon have occasion to admit this.

We cannot too frequently repeat, that one can no longer study French architecture by taking a single province, that one cannot study the language, unless one takes account of the different forms of the language, that have become dialects of our days, but which actually in the 12 th century were dialects having grammars syntaxes and varied turns. No part of architecture is better adapted to show those differences of schools than the profiles, which are the most approved expression of the genius belonging to each of those schools, so that in certain monuments built in a province by a foreign architect, while adopting the methods of building and of general arrangement accepted in the locality, they clearly manifest the origin of the artist by the profiles, that are really the ordinary language of the architect. One can make the contrary observation. For example, there are Gothic monuments built in Auvergne (a province in Gothic architecture could only be in a state of importation), whose profiles are those of Auvergne).





the desired to speak the language that he did not understand. There are other edifices like the hall of the synod of Sens, built in a province subject to Champagne influence, where the general arrangement of the system of construction is local, and where the profiles mostly belong to Isle-de-France. Like the choir of church S. Nazaire of Carcassonne, where the plan, ideas, forms of piers and external appearance, are all southern, and where the profiles indicate the presence of an artist of the royal domain. This artist has expressed the ideas adopted in the locality by means of his own language. This part of our national architecture therefore merits our attention and delicate study, for it gives the means, not only of fixing positive dates, but also of indicating schools. This study should be made in each province, for certain profiles seen adopted in 1299 at Paris, will again appear in Poitou only in 1230, with some modifications made by provincial genius. We could cite monuments in Champagne from 1250, that in Isle-de-France would be placed at the beginning of the 14th century, by the aid of the profiles and by eyes little trained. Thus one should study the profiles in the only truly original edifices due to the artists of the first order, and no longer take into account certain oddities or exceptions, no more than to have perfect knowledge of a dialect, of manuscripts badly copied or of rude works. Every epoch and even our own, has produced barbarous works, not by them is an art to be judged, nor to be studied, for a stronger reason. This study made with the eyes of a critic demonstrates to us again that in this art, so long and unjustly disdained, there exist laws as well established as in the arts of Grecian and Roman architecture; that those laws rest on principles no less imperious; for if it were otherwise, how explain certain similarities or diversities and never departing from the dominant principle?

Let us now see some profiles of the arches and vaults around the choir of the cathedral of Amiens, that date from about 1240. (Fig. 13). A is the profile of the transverse arches, B that of the diagonal arches, at 1/10 full size. Dating from that epoch, the methods employed for tracing the profiles are more and more subject to geometrical laws and to regular dimensions. Thus in the profile A of the transverse arches, the lower round has a diameter of 8.4 ins. Through the centre of





this round, drawing a line a b at  $45^\circ$ , the intersection of this line with the vertical c b gives a b the edge of the upper cavetto. The lower round is engaged for  $1/12$  its diameter in the line e f. The line g n at  $45^\circ$  is tangent to the lower round and also tangent to the upper round l, whose diameter is 3.54 ins. This round is likewise tangent to the vertical c b prolonged. The radius of the upper cavetto equal the radius of the round l, its centre being at i. The centre m of the lower cavetto is placed at the intersection of the line e f with a vertical tangent to the upper round, and the radius of this cavetto is 2.6 ins. The band b c is 6.35 ins. the fillet p joins the great round by means of two reverse curves with centres at r. One conceives that these methods of drawing facilitate laying out. The vertical c o has 12.7 ins. This base being taken and the line og drawn at  $45^\circ$ , all the members of the profile are thus inscribed within a very simple outline. As for the profile B of the diagonal arch, its width is 12.7 ins. The face s t is 10.6 ins and the line t v is drawn at  $45^\circ$ . The diameter of the lower round of this profile is 5.8 ins. From the point x, drawing a line x y at  $60^\circ$ , one obtains the point y, the edge of the upper cavetto. The upper round has a diameter of 2.6 ins. It is easy to recognize that these lines are drawn with a view of giving to the profiles the light appearance suitable for the arches of vaults, leaving to the stone the greatest possible strength. The bottom edge on the axis below the great rounds clearly indicates the curvature, which could not be a cylinder, for the architects from the beginning of the 13th century, as we have seen in the preceding examples, felt the necessity when they terminated the arch by a round, to arrest the light (diffused in the interior) on this round by a projecting rib, at first composed of two straight lines, then soon with two curves with a flat fillet. In fact, when one observes the effects of light on curved cylinders without ribs, there is a passage of half tints, of lights and shadows forming a very elongated spiral, destroying the cylindrical form and leaving undecided surfaces; so that the secondary mouldings with their cavettos assume more importance to the eye than the principal member. It was necessary to rib this to give it all its value and make it appear resistant and projecting, and at the same time light.





Thus they could henceforth renounce profiles of arches with lateral rounds and a wide flat filled between them, like those given in Fig. 16, which had the inconvenience of leaving even at the middle of the profile a member apparently weak, because it remained in the half tint and did not catch the light strongly. It was then a profound study of effects, that thus led gradually to modify the important profiles of the arches of vaults, and not a fashion or a capricious desire of change.

However, the architects of Isle-de-France seem to have disliked to adopt the projecting ribs under the principal rounds of the arches of vaults, until about the middle of the 13th century. They attempted to give these arches an appearance of firmness by other means.

The parts of the abbey church of S. Denis, which date from about 1240, furnish us with an example of those attempts (Fig. 19). At A is drawn the profile of the archivolts of the side aisles; at B is that of the transverse arches, and at C and D are those of the diagonal arches. The profiles of the archivolts at A, half of which we have given here, because of their depth still partake of preceding drawings with rounds at the angles and an intermediate flat. At a we indicate a variant, i.e., the cavetto with centre at c with a straight part, and the cavetto centre at b. The profile of the transverse arch B presents a very labored drawing: the line a b is inclined at  $60^\circ$ . Thus as our Fig. shows, on this line are placed the centres c of the upper round and e of the intermediate cavetto e. From the centre c having been drawn a line at  $45^\circ$ , on this line are placed the centres of the lower round g of the astragals h and i. Further, the round g is tangent to the inclined line a b at  $60^\circ$ . Now this great round is 4.2 ins. diameter and the round C is 3.2 ins.

Drawing has become more methodical than in the preceding example, and the designer has given the lower round firmness by flanking it by two astragals, that strongly outline it by means of the black lines k. The centre of the upper cavetto is at l, i.e., at the intersection of the vertical b l with the horizontal drawn from the centre c. For the profiles of the diagonal arches C and D, the system of drawing is no less geometrical. Here the line a b inclined at  $60^\circ$  gives the centre b of the lower round, whose diameter is equal to that of





the transverse arches. From this centre b the line b e is tangent to the upper round and receives the centre of the astragal f and that g of the cavetto. Although the members may be of different diameters in the two examples C and D, one sees that the mode of drawing is the same. On the details E and F of the principal rounds we have given two of the methods employed at that epoch to rib these cylinders. In example E the sketch gives the sharp edge obtained by means of tangents at  $30^\circ$  (that edge being sometimes cleared for more distinctness, by means of a concave line with centre at h on a perpendicular drawn from the line at  $30^\circ$ ).<sup>1</sup> In example F the centres of the arcs i, k, are taken on the angles of an equilateral triangle with side of twice the radius of the round.

Note 1.p.317. For example, for the lower rounds of the transverse arches of the S. Chapelle of Paris.

According to whether one desires to obtain a wider or narrower fillet, the section o is taken higher or lower on the circular arcs. Experiments here produce formulas. Henceforth angles at  $30^\circ$ ,  $60^\circ$  and  $45^\circ$  will serve us for drawing these profiles, employing the simplest methods. The Burgundian architects, that as we have stated, are such good designers of profiles, will demonstrate to us how the method can be joined to the freedom of the artist, and will become for him, if he knows how to use it, not a restraint, but on the contrary, a means of avoiding loss of time and endless experiments. We come to the moment when the art of architecture, henceforth freed from Romanesque traditions and left to lay hands, is no longer compelled to copy more or less fortunately consecrated forms, but is based on reasoning, seeks and finds methods, that are not a restraint for the artist of genius, but prevent the ordinary artist from going astray.

The profiles, like the system of construction, of proportion and of ornamentation, proceed in a logical course favoring progress, and the search for the better. In fact, the architectural styles worthy to be regarded as arts, among the Egyptians, and Greeks, as with us in the middle ages, have proceeded in the same fashion; seeking by sentiment or by instinct, if you will, forms that appear most appropriate for the needs; by a series of experiences coming to give those forms a certain fixedness, then gradually establishing methods and finally for-

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formulas, principles founded on true feeling and on experience. Then the architect, taking his pencil, compasses and triangles, no longer works in uncertainty in seeking the forms that his fancy will suggest to him; he starts from an established system and proceeds systematically.

We know all that can be said against the adoption of formulas; but we must state that no architecture worthy of the name has not inevitably ended in a formulary. More than any other people, the Greeks had methods leading to formulas, and if some one doubts this, we request him to consult the very remarkable works of M. Aures on that subject.<sup>1</sup> But the architectural formulary of the Greeks is only based on a harmonic system of proportions, developed under the influence of the delicate feeling of that people. This formulary commenced by a simple empirical method established by experience, is not a logical deduction from reasoning, but is a canon, the beautiful in figures; thus it could maintain itself no longer than is maintained the law established under the power of a sentiment; this formulary is overturned by each generation of artists. It is not the same in France under the empire of the lay schools; the method from the first is based less on sentiment of form than on reasoning; being logical in its course, it only leads to a formula on the eve of the day, when the art is definitely lost. For from the moment that the method becomes a formula, all deduction becomes impossible: therefore in an art whose element was incessant progress, the formula was death.

Note 1.p.514. *Theorie du module*, by M. Aures, chief engineer of bridges and roads. -- *Etudes des dimensions de la colonne de Trajans*, by the same, etc.

The examples of profiles already presented to our readers indicate a tendency, at first vague, then more emphasized, to toward a geometrical method for tracing the different members composing it.

Feeling, but a reasoned feeling, evidently caused the invention of the profiles given in Figs. 15, 16 and 17. It was necessary to lighten to the eye the arches supporting the high vaults, yet leaving them the greatest possible strength. In the two Figs. 16 and 17, it is evident that those rounds, placed like so many ribs between cavettos, or placed in the salient angles, tend to leave to the stone all resistance, while





making it appear lighter like a bundle of astragals. Reasoning then intervened for much in drawing these profiles. Besides, it is no less evident that the architect has subjected his reasoning to a certain feeling for form, ratios between solids and voids, and effects; but the geometrical method for drawing those profiles is still uncertain. In the example (Fig. 18) that general method is already developed. One sees that in this Fig. the trace A places the line at  $45^\circ$ , and the trace B has the line at  $60^\circ$ , as limits of the resisting portion of the stone; the rounds being no more than an additional strength, at the same time as an apparent lightening.

In Fig. 19 the geometrical method of drawing is completed and perfected; the lines at  $45^\circ$  and  $60^\circ$  without exception receive all the centres of the rounds, and the principle of resistance of the transverse arch like that of the diagonal arches is the same as that adopted in the example (Fig. 18). The hollows are perhaps too pronounced not to alter the strength of the stone in the example (Fig. 18), but in Fig. 19 are replaced by the astragals, that while producing a very vivid effect to the eye, leave to the stone all its vigor.

Let us now see how about 1230, the Burgundian architects proceeded in drawing the profiles of arches fulfilling the same purpose as the preceding; now the difference in quality of the material employed, the feeling peculiar to that province, caused to be interpreted the methods already adopted in Isle-de-France. Here (Fig. 20) at A is a transverse arch; at B is an archivolt; at C a transverse arch of the great vault; at D, D' are diagonal arches, and at E a side arch of the church of Semur-en-Auxois.<sup>1</sup>

Note 1.f.515. These profiles, like the preceding, are drawn at 1/10 full size.

For the transverse arch A, the line a b is at  $45^\circ$ , the line c d is at  $30^\circ$ . All the centres are placed on those lines. The base line e f of the profile having been divided in 5 parts, one of those parts gives the diameter of the lower cavetto and of the lower round a. Here the curves are broad, the hollows are pronounced, and the materials very resistant (stone from Pouillenay), lending itself to this deep and strong cutting. In the archivolt B, the centres of the cavettos and rounds are placed on the lines at  $60^\circ$ . In the transverse arch C and the





diagonal arches D, D', the centres are placed on lines at 45°. In the side arch E, on a line at 60°. The breadth of those profiles contrasts with the delicacy of choiceness of those adopted in the church of S. Denis, although the church of Semur-en-Auxois may be of small dimensions relative to that of the abbey of the royal domain. The method of drawing is yet uncertain in details, and proceeds much from feeling, although in general principles it conforms to that established in Isle-de-France; but in the architecture of Burgundy, although it concerns the construction, the composition of the masses, the profiles or the ornamentation, one always notes a certain freedom, boldness, and a considerable part left to sentiment, which gave that school a particular character.

Burgundian architects recognize the rules and methods of the lay school of Isle-de-France, but subject them to their local character. They adopt the grammar and syntax, but they retain the turns and utterance peculiar to them.

The great Cluniac school and the nature of the limestone materials of the country leave an ineffaceable trace of their influence on the forms of Burgundian architecture of the 13th century. It is entirely otherwise in Champagne; in that province the materials have small resistance, are scarce on a great part of the territory, and do not permit boldness in drawings. Thus the profiles of the architecture of Champagne, from the Romanesque epoch and from the beginning of the 13th century, are low, small and sadly timid, if one can so speak, are encumbered by secondary members, and fear hollows. It is interesting to observe, now in a part of that province located on the frontier of Burgundy and Champagne at Sens, the architect of the hall of the synod has sought to harmonize the designs of Isle-de-France with those of Champagne. The hall of the synod was built about 1245 by an architect of the royal domain, borrowed from Champagne certain arrangements in construction suited to that province, from Burgundy certain parts of the ornamentation, from Isle-de-France the profiles, but still modifying them somewhat according to the principles of Champagne. This tendency towards a fusion makes him hesitate; he pretends to continue the French profiles by giving them more fullness, according to the method of Champagne. Thus (Fig. 21) he traces the transverse and diagonal arches of the vaults





of the great hall of the first story A, reinforcing the lower round.<sup>1</sup> This lower round is drawn as shown by our Fig. by means of two centres a, a'. To conceal the obtuse junction of the two circles, he caused the fillet h to project. From the point a' drawing a line a'c at 45°, he takes on that line the centre c of the second round. Drawing a line cd at 30° from the centre c, and from the fixed point e drawing the line ed at 60°, he obtains the point d, the centre of the upper round. Drawing f from the same centre c a line cf at 60°, he obtains the fillet g, and on the line the centre f of the lower cavetto, whose curve intersects that of the great round. He compensates for the angle h by a circular arc, whose centre is placed at i. This moulding takes a depressed curvature that does not belong to the architecture of Isle-de-France, but it is elsewhere studied with care, and assures in execution a resistant and firm appearance. Due to the fillet b, that prevents the junction of the two circles a, a', these two curves do not appear to be a portion of a circle; but not to develop too much in the eye this important member, the lower cavetto encroaches on it and takes away its heaviness. The designer has thus obtained more strength without giving to his profile a less light appearance.

Note 1.p.517. This drawing is at 1/5 full size.

But all designers do not proceed with that ingenuity. In Normandy and Maine, the profiles, while being traced according to the methods that we have just indicated, emphasize a tendency toward exaggeration of effects and a defect in the ratios of proportion. An artist from Maine would trace this profile as it is indicated at B. He would accent the intersection k; he would also give a curve to the fillet l; he would exaggerate the projection of the lower fillet m, or indeed as the profile C indicates, he would flank the great lower round by an astragal n, or even by a lateral fillet o, and he would recover the stops, fillets and angles at p q by diminishing the radius of the second round. This tendency to the exaggeration of the cavettos, to the multiplicity of the angular especially develops in England from the middle of the 13th century. The profiles of that country and that epoch are charged with a number of rounds, fillets and deep hollows; but the method of drawing scarcely varies; this proves that a system





in architecture is a means of permitting everyone also to follow his own taste and feelings. Suppress method in drawing the profiles of the architecture called Gothic, and one falls into a chaos of uncertainties and experiments. Caprice is mistress, and caprice in an art which should borrow so much from geometry can only produce nameless forms. Is not this the method that gives to architectural profiles after the 12th century in France an appearance so striking, such a particular style, that one cannot take a drawing of 1200 for one of 1220, that one cannot confuse a Burgundian moulding with a moulding of Champagne? Assume that a geometrical method does not exist, how is to be traced one of these profiles, at what point to commence or end? How give to all these members a proportion and harmony? How combine them together? And how much time is lost in trying for the best in an uncertainty! We have frequently seen our colleagues seek designs of profiles by the help of feeling alone, without beforehand seeking a method; if careful, how many times would they not go over a drawing without ever being certain of having found the best?

Let us now see how in Champagne, the architects, always following the system of angles at  $45^\circ$ ,  $60^\circ$  or  $30^\circ$ , for drawing the profiles of arches, came to give those profiles a character that belongs to their genius and accords with the nature of the materials employed.

The stone set in the work in the church S. Urbain of Troyes, which dates from the end of the 13th century, is limestone from Tonnerre, fine and compact, resistant but brittle, as the stonecutters say, i.e., it breaks easily, either in working or when set, with deep hollows. The skilful architect of church S. Urbain, so frequently mentioned in the Dictionary, knows well the nature of the material that he employs. He knows that it is necessary not to hollow it too much, if it has to carry a load; for example, for the rounds of arches, that they should not be separated by too deep hollows; still he claims to erect an edifice of a light appearance, remarkable for the delicacy of its members. Here is how he will trace at A (Fig. 22) the archivolts of the nave.<sup>1</sup> As in the preceding example, he will give to the lower round two centres a, a', a rib b with recurved lines with their centres placed on the lines a c, a'c', drawn at  $60^\circ$ ; the radius c b being equal to the radius a b.





From one of the centres a he draws a line a d at  $45^\circ$ . On that line he places the centre of the second round. But note that the architect must turn these archivolts with two rows of voussoirs, and with a side arch for the vault of the side aisle. The second round of 4.0 ins. diameter is tangent to the stepped lines of the second voussoir; its position is then fixed. Drawing from the centre e two lines at  $30^\circ$  and  $60^\circ$ , the intersection of these two lines with the stepped lines gives him the centres of the recurves of the fillet f. The horizontal drawn from this centre and meeting the vertical stepped line gives him at g the centre of the cavetto h. The vertical f g prolonged gives him the fillet surmounting this cavetto. He then traces the upper cavetto i, whose centre is on the vertical d j. This centre is on the level of that of the astragal k. On the lower voussoir 12.2 ins. wide, to make the fillet l sufficiently strong to resist the pressure, he draws from the centre a' a line at  $45^\circ$ . From the point of intersection of this line with the circle of the round, drawing a horizontal, he places the centre of the astragal on this horizontal, taking a line at  $45^\circ$  as tangent. This astragal fills the space that would be too pronounced at g, and even in fear that the hollows remaining might not be sufficiently sharp, he traces the second astragal s, whose centre is placed on the line at  $45^\circ$ . The same fear of hollows causes him to trace the astragal t on the second voussoir. The astragals k, t and p, have 1.6 ins diameter, s is 1.0 in. The trace of the side arch explains itself. By the aid of these astragals the designer has suppressed dangerous hollows, and still has obtained a desirable effect, in that the principal members, the rounds, further ribbed by their projecting fillets, assume their projection and importance by the proximity of the slender members and the black lines that outline them. To place a very fine moulding, an astragal of small diameter, beside a round is to give to that a value that it would not have if isolated. The Greeks in tracing their profiles well understood that rule and applied it. By contrasts they gave value to mouldings, far more than by actual dimensions.

Note 1.p.519. At  $1/10$  full size.

The drawing of the diagonal arches of the church S. Urbain given at B and C is no less remarkable. That at B must be res-





resistant, and the hollows are replaced by astragals; the one at C having no load can be more hollowed. One sees how the method of drawing the two profiles is simple, entirely obtained by the intersection of lines at  $30^\circ$ ,  $45^\circ$  and  $60^\circ$ . In example C the two lines at  $60^\circ$  give exactly the resistance lines of the stone, the members all being left outside. In the same church and in the other edifices of the same epoch in Champagne, one sees the trace D for the lower rounds of the arches. The triangle a b c being equilateral, and consequently the lines b a, c a are at  $60^\circ$ .

In the profile of the archivolt A, not only the lower round is ribbed, but the lateral rounds are also. By multiplying the members, by replacing hollows by astragals, one feels the necessity for giving more energy to the principal members of the fillets forming ribs, by strongly arresting the light, allowing this result to be obtained.

The architects of Isle-de-France did not voluntarily decide to resort to these projecting ribs; if they employed these for the lower rounds from the end of the 13th century, at first angular and then with recurves and later fillets, they adopted them for lateral rounds of the arches but rarely before the middle of the 14th century. These architects seem to have taken up the task of simplifying the general methods, that they had first applied. The church S. Nazaire of Carcassonne furnishes us with a very striking example of this fact. This church, whose structure was built between the years 1320 and 1325, gives sections of transverse and diagonal arches, always proceeding on the system developed above, but with notable simplifications.

In the profile A of the transverse arch (Fig. 23), the lower round (5.7 ins. diameter) being traced, from its centre a is drawn the line a b at  $45^\circ$  to its intersection with the vertical c b, the limit of the profile. The angle c b a is divided into two parts by the line b e. Taking into account the projection the projection of the rib, on that line is placed the centre f of the round (4.2 ins. diameter); the radius of the cavetto equals that of the round and is placed at g. The centre h of the great cavetto is placed on the line at  $45^\circ$ . To trace the ribs with recurves, there are traced the equilateral triangles a i j, f l m. The same method with sensible differ-





differences sufficiently explained by the Fig. was employed for the profiles of the diagonal and transverse arches B, C, E, F. Do not forget that this church was built after the city of Caracssonne was comprised in the royal domain, and very certainly by an architect of that province of Isle-da-France, since all details of the architecture prove it. Here the projecting ribs appear on the lateral rounds, but only in the two examples a and F.

All architecture established on logical principles and on methods derived from those principles cannot stop in the path; it must proceed by a series of deductions. This phenomenon is observed among the Greeks, as among us during the middle ages.

Every discovery proceeding from the systematic application of a principle is the starting point of new forms.

It appears that the art of architecture, which is the creation of the second order, proceeds like nature itself, which without ever departing from the primitive principle, develops the consequences while always retaining a trace of its starting point. If we have been seized by a profound feeling of curiosity and of philosophic interest in gradually studying the architecture of the middle ages in France, it is because we have recognized in the developments of that art a creative system, that carries us back to those logical experiments, so natural in the labor of its works. This art so strongly disdained, whose first fault is to have been developed among us, the second being to require for understanding, the mental stress, does not proceed as in our days by a succession of fashions, but by an unbroken connection in the application of accepted principles. So that in decomposing an edifice of the 15th century, one can find therein the development of what those of the 12th century give in germ, and that in presenting a series of examples selected between these two extensive epochs, one cannot mark an interruption at any point. Likewise in the order of creation, comparative anatomy presents in a series of organized beings a ladder with sensible steps and which leads us without abrupt changes from reptile to man. For this we give really to this architecture, as to that of Greece, the name of art, i.e., we regard it as an actual creation, not as an accident.

Do not lose sight of the preceding examples. In those exam-





example the same method of drawing is adopted; experience, the need to be satisfied, the feeling of something better, of absolute perfection, evidently guide the artist. It concerns the subjection of the material to a form appropriate to the object, removing from it everything superfluous, in giving it the appearance that best indicates its function. Architects are not yet satisfied with the results obtained, for hieratism is the opposite of this art, always in quest of new applications, always seeking but without abandoning the creative principle. In these last examples, the material has already been reduced to its minimum strength; to lessen still the strength would be to suffer the most disastrous contingencies. But the minimum of strength obtained, it is necessary to give to these members a lighter appearance without troubling the eye. The architects have observed that the projecting ribs added to the rounds give them an appearance of strength, of resistance, that far from destroying the effect of lightness, even augments it. They observe that bodies subject to pressure, like stone arches, resist in accordance to their actual section, but according to the form given to that section. The principle of our modern engineers, applied with exact knowledge of the laws of resistance of bodies, for example of cast iron, the architects of the middle ages sought to apply to stone, but taking into account the properties peculiar to that material, which is far from having the cohesion of metal. In fact if a column of cast iron whose horizontal section A (Fig. 24) resists a much greater pressure than one with section B (those two sections having equal areas), it is evident that one could not give a stone column the section A, because it would rupture at a under the load. But if a stone pier, instead of being cut according to the horizontal section C, is cut in the form D (otherwise with equal areas), the pier D must resist a much greater pressure than C, the hollows not being sufficiently pronounced for one to fear ruptures at b. To the eye the pier D will seem both lighter and more resistant than C. Let us add also, that building stone being quarried in prisms with equal areas of beds, the piece D when cut is nearer a square form than the piece C. The piece D profits better by the natural form of the stone than that at C. But why will the pier D better resist a load or pressure than the pier C, since after all the





extension of the external surface does not give for stone, as for metal, an external surface the more resistant as it is more extended, the sectional areas being equal? It is because the section D, presenting more bearing, is less subject to suffer deviation, and consequently has a surplus of load on a point. Likewise in drawing arches, the resistance to pressure being exactly resolved by the section d e f (see at E), we not only increase the resistance by the additions g, h, i, but prevent deviation of the arch, that by transferring an excess of pressure to a point can cause rupture.

We have sufficiently emphasized elsewhere,<sup>1</sup> how the architects of the lay school had adopted a structural principle based on equilibrium, and consequently how they had adopted the elasticity of structures as a means of stability. Admitting elasticity in the construction, it was necessary to admit its consequences in the details, i.e., in drawing the arches, a system of shores, of lateral abutments. The rounds of the arches have no other function. We have seen (Fig. 19) how when these architects mistrusted the quality of stone, when they found it brittle, the hollows were made more shallow, and were even replaced by astragals, forming a contrast to the rounds by the many black lines and slender members, so as to leave all their real value to these. But those rounds were often almost detached as in the examples (Figs. 20, 23), and if the material did not have a considerable force of cohesion and resistance,<sup>1</sup> they split at the hollow by the effect of unequal pressures. The architects about the end of the 14<sup>th</sup> century having had occasion to note these ruptures, pretended to remedy them, yet without diminishing the light appearance of the profiles of the arches and even accenting that appearance of lightness. Thus we see them (Fig. 25) adopt profiles of arches in which the members are less detached from the mass, yet acquire an appearance of extreme delicacy. The method for tracing these arches is the same as that adopted in the last examples. the surface a, a', b c (see the profile of the transverse arch A) is the minimum area of resistance, the two lines a c, a' b being at 60°. No hollow comes to weaken this surface, but the supplementary members, the rounds with ribs give stiffness to the voussoir and oppose its deviation. Although wide, the cavettos leave strong attachments to the rounds, and these assume





an appearance both lighter and firmer by the addition of very pronounced projecting ribs. The sketch A does not need description after all our preceding definitions.

Note 1. p.524. See Art. Construction.

Note 1.p.525. Observe that the arches traced in Fig. 23 are cut in a very compact sandstone, just as those in Fig. 20 are in stone from Pouillyenay, which is almost as resistant as granite.

Always by sections with lines at  $60^\circ$ ,  $45^\circ$  and  $30^\circ$  are the centres obtained. One would prefer to glance at the sketch B of a lower round and the mode of finding the centres of the re-curves of the rib, the lines e f being at  $60^\circ$ . But the lower rounds, with a diameter larger than the others, present at the sides soft surfaces with regard to the other ribbed rounds of less diameter. Then one also pretends to rib laterally these great lower rounds (see at C); thus they are given greater resistance, and they are made to appear more detached and lighter; Yet the original curve is seen again in i j, as if to not lose the principle of drawing. These lateral ribs give a too prismatic appearance to these lower rounds; they were promptly renounced, and the lateral rib is raised to an axis at  $30^\circ$ . (See the example D at k). Then the generating form of the lower round appears less changed, and at this system the architects stopped at the beginning of the 15 th century.

Constructors had also recognized that the force of resistance of voussoirs is below the extrados, i.e., at m (see profile D)- On the other hand if we inquire for the means of constructing the triangular filling components of Gothic vaults, we see that these triangles are not constructed by the aid of centres and forms, but by means of movable wooden curves (Art. Construction, Figs. 57, 58, 59, 60); that these wooden curves are supported on the extrados of the transverse, diagonal and side arches, and that it was therefore necessary, either to make skew gains on the angle of the extrados of these arches, or to leave a little space between this extrados and the filling. The architects of the 15 th century took this necessity of construction as a pretext for modifying the profiles of the arches at their point of contact with the fillings of vaults; they practised making the bevel indicated at o (see profile D) to receive the end of the wooden curve, and this contributes also to give an appearance of extreme lightness to their arches





by detaching them from the fillings, and giving more importance to the lateral ribs.

Note 1.p.526. From the choir of the church at Eu.

We come to the last expressions of the method adopted for drawing the profiles of arches during the first half of the 15<sup>th</sup> century. Let at A (Fig. 26) <sup>1</sup> be a transverse arch composed of two superposed voussoirs. The lower round a is first traced by means of two circles; a b c being an equilateral triangle, i.e., the lines a b, b c, being at 60°; the radius of the recurve of the fillet c b being equal to the diameter a e. At f is placed the centre of the curve of the side rib, more or less distant as one desires to have this rib more or less accented. From the centre g is drawn the line g h at 30°; from the same centre g the line g i at 60°. On this line g h is placed the centre h of the great cavetto, so that its arc may be tangent to the line g i, and not cut into the triangle of resistance. From the point h is drawn the vertical line h k. Half the width of the voussoir l m k being fixed, the second round will have as diameter the interval between the two verticals k h, l n.

Note 1.p.526. From the church of Eu.

The rib of this round will be on the axis o p at 60°; so that the projection of the rib does not exceed the form given by the line l n prolonged. From the centre p is drawn the line p q at 60°. On this line is placed the centre r of the little cavetto with radius equal to that of the round p. The vertical l n gives the upper fillet. The centre of the round of the second voussoir is placed on the line p q at 60°; the rib of this round is on an axis at 60° drawn from this centre; the centre of the lower cavetto is on a line at 30°, and the centre of the upper cove is on the line p q, the chamfer s remaining for setting the wooden curves. The method of drawing is simplified; one decidedly renounces allowing to be seen the original curve of the great lower round (see sketch B); one no longer permits to be seen of the original curve of the secondary rounds more than that external one. The ribs of these rounds are placed on the vertical axes, and they are traced as indicated by the detail C, by employing for placing the centres only lines at 30° and 60°. Our Fig. further explains itself. It is necessary to remark, that if in this last example





the triangle of resistance has been weakened at *t* by the curve of the great cavetto with centre at *v*, the resistance of the lower round has been increased by becoming a concave prism. Thus area has been given to the resistance. The effect of lightness and firmness at the same time is emphasized by the rounds with vertical ribs by the cavettos that suppress the inner portion of the curve of the rounds. The cutting is less complex and the form is more easily understood.

Thus we come by a series of almost insensible transitions, all derived from a uniform method, from examples given in Figs. 18 and 19 to this; and yet if no account were taken of the intermediates, it would be difficult to admit that the last of these profiles is only a deduction from the first.

Perhaps we may be thought to have enlarged too much on these details of the architecture of the middle ages; but we find there an occasion of emphasizing the spirit of method, the logical sense that guides the architects of the beginning of the lay school in the 12<sup>th</sup> century.

The work of analysis to which we have devoted ourselves concerning the profiles of arches could be done for all parts constituting the architecture of that time; thus one would follow step by step by provinces the experiments, the establishments of methods and the incessant improvements of this French architecture, that it is not permitted to admire (this is a matter of taste), but to which cannot be refused unity, science, logical depth, fixed and well defined principles, flexibility and the elements of perfectibility.

In the matter of architecture, the capricious men of our time have not always been happy in their attempts, and our recent monuments betray their efforts; which tend to prove that the art of architecture cannot do without a system added to the qualities, that we have just enumerated; and that instead of rejecting the study of the art of the middle ages, there would be strong reasons for cultivating it, were this only to know by what means the masters of those times came to produce such grand effects, and also to not remain below their works. We admit that this will require labor, much labor; and it is easy to deny the utility of anything, which we do not wish to take the trouble to learn!

Certain persons not being able to form an equation, indeed





pretend that algebra is only a conjuring book! Why should we be surprised to hear men deny the logical sense, the cohesion and practical utility of this art, that we have allowed to be lost, and that we neither understand nor utilize its resources?

The methods followed for tracing profiles of arches are invariable, because an arch is always seen at all angles possible. Whatever the height at which it is placed, its curvatures presents to the eye its sides and its intrados under all aspects; but it is so with a band, base, abacus, and a horizontal profile in brief, whose position by the effect of perspective can mask or at least diminish a part of the members. The Greeks evidently took into account the place and the tracing of profiles; but their edifices being relatively of small dimensions, the perspective deformations could have no great importance. The Romans do not appear to have been interested in the influence of perspective on profiles. These are traced in an absolute manner according to an accepted method, without taking account of the position occupied above the eye. It does not appear that during the Romanesque period men modified the tracing of profiles according to their position; but from the beginning of the 13<sup>th</sup> century the study of the effects of perspective on profiles clearly appears. We find a remarkable example in the cathedral of Amiens erected from 1225 to 1230. The internal belts, the bases and abacuses of the triforium are traced according to the point of view taken from the pavement of the church. (Art. Triforium).

See how the architect of the nave of Notre Dame of Amiens proceeded to trace the abacuses and bases of the little columns of the gallery (Fig. 27). The largest visual angle perpendicular to the nave is  $60^\circ$ , allowing one to see the abacuses. The profile was traced according to the method indicated at A, a method unnecessary to describe after the preceding demonstrations.

According to this visual angle, the abacus is reduced by the perspective to the profile A'. By removing in the horizontal direction, i.e., by looking at the capitals of the bays beyond that found opposite to one, it is evident that one sees the profile develop, yet without ever taking the importance in height, with regard to the projections, that is given by the geometrical drawing. For the bases the profile is indicated





at B. Observing them at the angle of  $60^\circ$ , which served for tracing them, one can see only the members indicated in B'; but taking a little greater distance, so as to see them at an angle of  $45^\circ$ , the profile given by the perspective is that at B'', which is satisfactory, and in harmony with the proportions of the little columns.

In general in Gothic edifices the inclination of the visual angle influences the trace of the profiles; it is then important when one measures and draws them, to mention their position. We cannot insist too strongly on the differences in drawing internal and external profiles in Gothic architecture. On the facade of the cathedral of Paris, the profiles develop in height in relation to their projection, according to the height at which they are placed; so that the abacuses of the capitals of the great open gallery are made of a course equal to that of the capital. Yet from the Place in front however, these abacuses do not appear to have more than a quarter of the height of the capital.

In the interiors, the horizontal profiles, to not lose their importance, and to not interrupt the vertical lines that dominate, have only a small projection. But on the exterior, as much to shelter the surfaces as to obtain great effects of shadow, it was necessary to give the profiles a pronounced projection; men observed in this case that they are always reduced on top by a wash, more or less inclined above  $45^\circ$ , which connects them to the upper wall plane, by thus avoiding always the bad effect of horizontal projections that mask a portion of the elevation, and reduce by as much the height of edifices. For example, it is clear that if one decorates a facade by profiles like those indicated at A (Fig. 28), the visual rays being according to the lines a b, the vertical parts c d are entirely lost to the eye, which cannot divine them; the monument seems to be lowered as much. But if the profiles are traced according to the drawing B, the visual rays follow and see the wash, and these conceal no part of the surfaces, which retain their real elevation, consequently their relations and proportions.

This is elementary, and it seems that it would be useless to demonstrate it; yet one does not seem occupied in our modern architecture with these simple laws, and daily we see ar-





artists themselves greatly surprised that an elevation well proportioned in elevation, no longer produces in execution the expected effect.

In the course of this work, we have had many occasions to present drawings of profiles, and we do not believe it necessary to extend farther on the subject. What we wish to demonstrate here is, that chance or caprice had nothing to do with tracing the architectural profiles in the middle ages, that these are subject to laws established by the necessities of construction, and on judicious understanding of effects.

#### PROPORTION. Proportion. Harmony.

The Greeks had a word to designate what we understand by proportion; "symmetria," of which we have made symmetry, that does not mean proportion at all; for an edifice may be symmetrical and not be arranged in proper or happy proportions. Nothing better indicates the confusion of ideas than false acceptance of words; thus we have also committed the fault of confusing in the art of architecture since the 16<sup>th</sup> century, symmetry, or what is understood by symmetry, with the ratios of proportion; or rather they have frequently thought to satisfy the laws of proportion by contenting themselves with only the rules of symmetry.

The most ordinary artist can easily adopt a symmetrical fashion; it suffices for that to repeat at the left what is done at the right, while a very refined study is required to establish a system of proportions in an edifice, whatever it may be. One should understand by proportions the ratios between the whole and the parts, logical and necessary ratios, such as satisfy both the reason and the eyes. For a stronger reason should one establish a distinction between proportions and dimensions. Dimensions simply indicate heights, widths and areas, while the proportions are the relative relations between those parts according to the law. "The idea of proportion," says M. Quatremere de Quincy in his *Dictionnaire d'Architecture*, "includes that of fixed and necessary ratios, constantly the same, reciprocal between the parts that have a determinate purpose." The celebrated academician does not seem to us to seize completely here the value of the word proportion. Proportions in architecture nowise imply fixed ratios, constantly





the same bottom parts having a determinate purpose, but on the contrary are variable ratios, in view of obtaining a harmonic scale. M. Quatremere de Quincy seems to us to express an erroneous idea concerning proportions when he adds:--

"Thus it is sensible that all the creations of nature have their dimensions, but not all have proportions so numerous and so evident, for example, that it would be impossible to determine with precision the reciprocal measure of the branch of a certain tree to the tree itself." The author of the Dictionnaire thus confuses dimensions with proportions; and if he had consulted a botanist, the latter would have demonstrated easily, that on the contrary there exists in all plants ratios of proportions established according to a constant law between the whole and the parts. M. Quatremere de Quincy again mistakes the true law of proportions in architecture, when he says:-- "A true system of proportions is based not only on measures of general ratios, for example, as would be those of height of the body to its size, of the length of the hand to that of the arm, but on a reciprocal and unchangeable connection of the principal parts and of the subordinate parts and of the least parts with each other. Now this connection is such that each one taken by itself, is suited to teach by its measure alone, what is the measure, not only of each other part, but even of the whole, and that this entirety can reciprocally by its measure make known what is that of each part." If we properly understand this passage, it would result from the application of a system of proportions in architecture, that it would suffice to admit a sort of canon or module to ensure putting the monument in proportion, and that then the proportions would reduce to an invariable formula of ordinary application. "Here, again adds M. Quatremere de Quincy, "is what does not exist and cannot be shown in the art of building of the Egyptians, nor in the Gothic; more useless still to seek it in any other architecture. And this is the incontestable prerogative of Greek architecture." It must be admitted that this would be very unfortunate for Greek art if it were so, and that if this art were reduced in the matter of proportions to the rigorous application of a canon, the merit of the Grecian artists would be limited to very few things, the laws of proportion to a formula.





Proportions in architecture are derived from more extended laws, more refined, and that are exercised on a field quite otherwise free. That the Greek architects may have adopted a system of proportions, a harmonic scale, is not and cannot be contested; but if the Greeks established a harmonic system that belonged to them, it does not follow that the Egyptians and the Gothic architects may not have adopted one on their own part. As much as to say that the Greeks, having possessed a musical harmonic system, one could find in the operas of Rossini and in the symphonies of Beethoven only disorder and confusion, because those authors proceeded quite differently from the Greeks. Whatever M. Quatremere de Quincy has said, proportions in architecture are not an unchangeable canon, but a harmonic scale, a correlation of variable ratios, according to the method adopted. The Greeks themselves did not proceed as assumed by the author of the Dictionnaire, and that is their praise, for there exists in their orders notable variations in proportions; with them the proportions are relative to the object or to the monument, and not to the orders employed. We have explained elsewhere <sup>1</sup> how certain laws derived from geometry were accepted by the Egyptians, Greeks and Romans, Byzantine and Gothic architects, when it concerned the establishment of a system of proportions applicable to very different monuments; how these laws were not an obstacle to the introduction of new forms; how being superior to these forms, they could control their ratios so as to present a harmonious entirety at Thebes as well as at Athens, at Rome as well as at Amiens or Paris; how the proportions are derived, not from a blind method, from an unexplained formula, but from ratios between the solids and voids, heights and widths, surfaces and elevations, ratios taken into account by geometry, whose study requires great attention, also variable according to the place and the object; finally, how that architecture is not the slave of a hieratic system of proportions, but on the contrary can change without ceasing, and find applications always novel, proportional ratios, as well as it finds applications varied infinitely, by the laws of geometry; and it is that in fact the proportions are the daughters of geometry, as well in architecture as in the order of inorganic and organic nature.

None 1-7-59. See 8th Bulletin and 1st-6th Reports.



Note 1.p.534. See 9<sup>th</sup> Entretien sur l'Architecture.

Proportions in architecture are first established on the laws of stability, laws of stability derived from geometry. A triangle is an entirely satisfactory figure, perfect because it affords the most exact idea of stability. The Egyptians and the Greeks started from it, and later the architects of the middle ages did the same. By means of triangles they first established their rules of proportions, because thus these proportions were subject to the laws of stability. This first principle being adopted, the effects of perspective were appreciated, and came to modify the ratios of general proportions; then were established the ratios of projections, of solids and voids, which are derived from triangles, at least during the middle ages. We have just indicated how in the least details of architecture lines inclined at  $45^\circ$ ,  $60^\circ$  and  $30^\circ$  have been adopted as generatrices of drawings and profiles. The triangles adopted by the architects of the middle ages as generators of proportions are:- 1, the right-angled isosceles triangle; 2, the triangle that we term the Egyptian isosceles triangle, i.e., whose base is divided into 4 parts and its altitude into 2.5 parts; 3, the equilateral triangle. It is evident that every edifice inscribed in one of these three triangles will indicate from the first a perfect stability; that always when one can recall by points apparent to the eye the inclination of the lines of these triangles, he subjects the drawing of an edifice to apparent conditions of stability. If portions of a circular circumscribe these triangles, the given curves will likewise have an appearance of stability. Thus the right-angled isosceles triangle A will give a semicircle; the isosceles triangle B and the equilateral triangle C will give broken arches, improperly termed pointed; curves that recall the general proportions of edifices generated by each of these triangles. These are general principles, as well understood, and which extend to the application, as we shall see.

Note 2.p.534. See what we say concerning the use of these triangles in Art. Ogive, and in the 9<sup>th</sup> Entretien sur l'architecture.

But it is first proper to indicated briefly the discoveries recently made by a learned engineer of bridges and roads, M. Aures, concerning the proportions adopted by the Greeks. M.





M. Aurez has demonstrated in several memoirs,<sup>1</sup> that to render an account of the system of proportions adopted by the Greeks, it was necessary to start from measures that they possessed, i.e., from the Greek foot and the Italian foot, and in what concerns the orders to seek ratios of measures, not at the foot of the column, but at its middle between base and capital; i.e., with the section taken at the middle of the height of the shaft. The shafts of the columns of the Greek orders being conical, it is clear that the ratios between the diameter of those columns, their height and intercolumniation, will sensibly differ if one measures the order at the base of the column or at the middle of the shaft. Then taking the measures at the middle of the shaft and using Greek feet in Greece or Italian feet in Magna Grecia (Italy), one finds ratios and measures, for example, such as 5 ft. for the columns and 10 ft. for intercolumniations, i.e., exact ratios according to the proportions indicated by Vitruvius. This is not the occasion here to insist on these ratios, it suffices for us to indicate them, so that it may be established that the architects of antiquity followed arithmetical formulas in the composition of their orders, numerical ratios, while the architects of the middle ages used triangles for obtaining harmonic ratios.

Note 1.p.536. See *Theorie du module deduite du texte de Vitruve*. Nimes. 1862. -- *Etude des dimensions de la Maison carree de Nimes*. 1864. -- *Etude des dimensions de la colonne Trajan*, 1863. -- *Memoire apropos der esamilli impores de Vitruve*. -- *Memoire sur le Parthenon*. -- *Etude des dimensions du monument chorogique de Lysicrote*.

There existed in France at Toulouse in a very flourishing province from the 11 th century a monument of great importance, but which was scarcely appreciated some years since, except by artists; it is the church of S. Saturnin, commonly called S. Sernin. That edifice being restored, or rather being relieved from the extravagances that denatured the general forms, suddenly in the eyes of the public assumed a considerable value. It is neither from the care devoted to the execution, by the richness of the sculpture or mouldings, nor by the details, that this enormous structure has struck the eyes of the multitude, but only by the ratio of its proportions. The church





of S. Sernin was conceived by a learned architect, well versed in the knowledge of his art, possessing principles very developed in respect to proportions, but executed by rude workman by the aid of mediocre materials, denatured in the 16<sup>th</sup> century by additions that destroyed the harmony, and therefore classed in the number of those attempts of barbarous times.

Today let us say, due to the removal of some bays of the wall, to replacing the roofs in their old form, here is an edifice, that massive as it is, presents an entirety of robust elegance, that charms the least experienced eyes, and furnishes a most interesting specimen of what an architect can obtain by a judicious balancing of the masses, and by a studied ratio of the parts, without the aid of any ornament. Grand instruction for us, who call to our aid all the resources of delicate execution, sculpture and superposed orders, complex profiles, yet do not always succeed in attracting the glance of the passer, and that spends millions to cause to be said sometimes: - "What do we want of those capitals, cornices and reliefs?"

The interior of S. Sernin, although much disfigured by a sanctuary richly overloaded by ornaments in bad taste, and by a coarse roughcast of a displeasing color, has alone retained the fame that it merits. This interior in fact produces a striking effect, although on the whole the edifice is not of extraordinary dimensions. Yet excepting some capitals, the interior of the church of S. Sernin shows scarcely any mouldings; its piers of rectangular section are bare, like the surfaces of the arches of the vaults; one sees in all that only a structure, and the effect that it produces is due to the perfect harmony of proportions. How was that harmony found?

Let us first state a major fact; which is that in the architecture of the middle ages the harmonic system of proportions proceeds from the inside to the outside. The Greeks did not always proceed in the same manner, but the Romans did in their vaulted edifices and in the construction of their basilicas. This statement requires some illustrations. If we consider externally the Parthenon, the Temple of Theseus, or even the temples of Magna Grecia, it is impossible to foresee the internal proportions adopted in those edifices. We see an external order conceived after an admirable harmony of proportions, but we cannot deduce therefrom the harmonic scale of the int-





interior. The external order of the wall of the cell conceals from us one or two superposed internal orders, arrangements of stories not visible on the exterior, open to the sky or with a closed covering, stories that the outside cannot divine. So much that even today, one can inquire whether the interiors of these monuments were entirely closed or presented a sort of court. If the orders placed in the interior are established in a harmonic ratio of proportions with the external order, there is a question purely conventional, but which cannot be appreciated by the eye, since those external and internal orders cannot be seen simultaneously. This is a theoretical satisfaction that the architect has given himself. Assume that the internal arrangement of the Parthenon is not known (and it is scarcely so), of ten architects that examine only the exterior, we shall not probably have two similar restorations of the interior. On the contrary, if ten architects examine only the exterior of the Roman baths, or the edifice known under the name of the basilica of Constantine at Rome, or again the church of S. Sophia of Constantinople, and they attempt to present the internal arrangement, it is evident that they will differ in that restoration only in some details of secondary importance. In edifices the external appearance is nothing but the exact envelope of the internal structure; consequently if we speak only of proportions, the harmonic system adopted for the interior, that has determined the proportions visible on the exterior. Thus in that the Romans have proceeded differently from the Greeks. But it is necessary to recognize, that the Romans were scarcely sensible of this order of simple beauty, expressed only by the harmony of proportions. They preferred richness and luxury or rarity of materials to an entirety, whose sole merit was to be harmonious; thus most of their edifices are not recommended by that exact use of proportions, that strikes us, and that one never wearies of admiring in the works of Greece. The Roman confuses dimensions with proportions, and for him grandeur does not consist in a harmony of forms, but in their extent. For him what is grand is so because it is vast.

Fortunately better endowed with the true feeling of art than the Romans, the western peoples of the Romanesque epoch gave to the study of proportions a singular attention. Either that





this feeling had been excited or renewed by the view of the Romano-Greek edifices of Syria, or that it was instinctive, we already see at the beginning of the 12<sup>th</sup> century, that a harmonic system of proportions was adopted in the provinces on this side and beyond the Loire. But the harmonic system is established on the principle of Roman construction, i.e., it proceeds from the interior to the exterior, so that the skeleton visible externally is only the envelope of the internal conception. To be clearer, the architect proportions his monument internally, and this method furnishes the system of proportions of the exterior. This was a correct idea, it must be agreed; for what is an edifice, if not a necessity clothed? Is it not the content that gives form to the case? Does not foot impose the form of the shoe? And if we make shoes today in which could be placed the hand or the head just as well or as conveniently as the foot, is this to reason correctly?

The Greek edifices, however beautiful they may be (at least those remaining to us), resemble slightly those pieces of furniture, that were called cabinets in the epoch of the Renaissance furniture, sometimes charming, admirably decorated, precious objects for amateurs and museums, but which are in fact a pretext, rather than the expression of a real need. It was then not surprising that the Greeks, passionate lovers of external form, should think of that form first of all, that they invented the orders in such happy proportions, left to place behind them services not always in intimate correlation with this harmonic system. The practical sense of the Romans each time that they ceased to imitate Greek monuments to remain truly Roman, had prescribed to them an entirely different mode of proceeding, as we have indicated above; but as we have also stated, there was lacking to them the delicate feeling for proportions, and the Greeks were correct in regarding their great concrete monuments, moulding the internal need, so to speak, just as we regard a beehive or the huts of beavers, finding there rather the brutal expression of a need than a work of art. Yet the Greeks were men with too much mind, not to seize all the advantage that could be derived from the Roman principle in applying to it new harmonic laws; this is what they did in Asia. They had the wisdom to abandon definitely the methods of proportions of the orders of antiquity, to





subject the Roman material structure to an entire system of proportions from the interior to the exterior.

That was a stroke of genius, or rather one of the resources that genius always knows how to find, when the conditions change within which it moves. It is then to reason outside the knowledge of facts and circumstances, to reason in vacancy, than to desire to relate all harmony of proportions to the Grecian orders alone. The Greeks adopted a harmonic system suitable for the orders, when the orders formed all their architecture, so to speak; they adopted another when Roman architecture imposed itself on the world, and to discover new useful and necessary means. From the point of view of the structure, Roman architecture was an advance from Grecian architecture; the Greeks were very cautious not to attach themselves to traditions, that might still be dear to them, they frankly adopted the material progress accomplished, and subjected their feeling as artists to their philosophical minds. Thus they have transmitted methods, that were very quickly developed in the midst of our West after the crusades.

The church of S. Sernin of Toulouse is one of the monuments of our southern peoples, which gives the most complete and most vivid impression of those Romano-Greek influences and principles of proportion, that were applied to Roman construction by Greeks of the late empire. In fact the system of proportions adopted at S. Sernin proceeds from the interior to the exterior.

This system of proportions is derived from equilateral triangles and right-angled isosceles triangles. We give first the half of the transverse section of the edifice (Fig. 2). The base A B was divided into 20 parts of 2.755 ft. each. Five parts were taken for half the width of the high nave; two parts for the thickness of the pier, whose plan is given at C; four parts for the width of the second aisle, including the thickness of the engaged pier; two parts for the thickness of the wall at the base and one part for the projection of the battlements at the base.

The height of the internal bases being fixed at the level E, on this level they worked to establish the system of proportions, for one will observe that the level of the bases, which is regarded as the horizontal line serving as base of the tri-





triangles employed to establish the internal proportions of an edifice during the middle ages. Thus these bases are placed a about 3.23 ft. above the floor in the edifices of the Gothic period, and at 2.13 ft. at most in the monuments of the Romanesque period. The insides of the engaged piers were fixed at 16 1/2 parts apart. From this point was erected the equilateral triangle a b, that gives the total height of the edifice, the level of the imposts c, the level of the imposts d, and the height of the upper capitals e. From the same point a right-angled isosceles triangle a f being erected, it gives the level of the crowns of the arches g, the level of the capitals of the triforium f. From the point h (12 parts of the axis of the second pier is erected the equilateral triangle h i, which gives at its vertex the centre of the tunnel and cross vaults of the high nave. The other lines that we have drawn at 45° or 60° sufficiently indicate the secondary operations, without any need of describing them in detail. What results from this system is that the architect has pretended to subject the proportions of his edifice to the trace of two triangles, rectangular isosceles and equilateral; for one will note that all the principal levels, the points that catch the eye, are placed on lines at 45° and 60°. The external outline of the edifice nowhere starts on any part of these inclined lines; it is as it were enveloped by those lines, and thus reproduces the internal forms and proportions.

If we examine (Fig. 3) two internal and external bays of S. Sernin, we likewise see that all prominent points of the architecture have been obtained by means of two of the same triangles, i.e., by the aid of lines at 45° and 60°, intersecting the verticals. In this manner results a geometrical relation between the parts and the whole; a sort of principle of crystallization, let us say, of great harmonic power. The proof is the effect that this edifice produces.<sup>1</sup> But the architect of S. Sernin, although employing a geometrical procedure for establishing the proportions of his edifice, has no less taken into account the effects of perspective.

Note 1.541. We have done this work after having not only measured and drawn the church of S. Sernin, but after we could remove the heavy additions that modified its upper parts, and when we had thus even found the places of the old cornices and





the slopes of the roof. Only after having determined the position of each part in the most certain manner did we give ourselves to the work of research, that has unveiled to us the system of proportions adopted by the primitive architects. Being struck by the happy proportions shown to us by the work of removal, and the singularly harmonious effect of the whole, we sought its cause; for one is deceived, if he supposes that chance or feeling alone could produce such results, on an edifice so extensive and composed of so many parts.

Thus for example, if we glance at the external bays at A (Fig. 3), we see that the great equilateral triangle bays a b, which in the interior B gives the ratio of the height of the capitals to the spacing of the columns of the bays, by the effect of the perspective externally, the roof that disappears to the eye, the point d falls on the point e, and thus the equilateral triangle d f g completes the lines a e inclined at  $60^\circ$ . The crown of the archivolt f, when one places himself in the axis of the bay, is in a harmonious relation with the spacing of the buttresses of the two bays at the right and left, although on the exterior, because of the projection of the roof of the second side aisle, the architect may have to proceed otherwise than in the interior, where the bay presents itself in a vertical plane, and make a new operation above this roof: still one sees by this example, that he has been able to establish a relation between the two operations, that of the lower side aisle and that of the triforium. All that evidently denotes a very scientific art, a profound study of effects, of superior knowledge and consummate experience.

Elsewhere <sup>1</sup> we have explained how the proportions of the cathedrals of Paris and of Amiens were established by the aid of Egyptian and equilateral triangles. In fact, the right-angled isosceles triangle is rarely adopted as the principle of proportions in the edifices of the Gothic period; the triangle whose base contains 4 parts and the middle vertical rises 2.5 parts above the base (Egyptian triangle), and the equilateral triangle become henceforth the generators of the proportions.

Note 1. p. 543. See the 9<sup>th</sup> Entretien sur l'architecture. Figs. 9 and 10.

We find a striking example of this in an edifice remarkable for the perfect harmony of its parts, the S. Chapelle of the





palace at Paris. This religious monument, from all time justly regarded as a masterpiece, proceeds with equilateral triangles in regard to its proportions.

The S. Chapelle of Paris consists of two stories; the low and the high chapels.<sup>2</sup> See (Fig. 3) how Pierre of Montereau proceeded to establish his plans and sections.

Note 2.p.543. Art. Chapelle, Figs 1, 2, 3.

At A is drawn one bay of the ground story; at B is one bay of the plan of the first story. In the second story the horizontal projection of the vaults is obtained by means of the equilateral triangle  $a b c$ , the apex  $c$  giving the centre of the bay of the vault; the ribs of the diagonal arches are projected in the lines  $b c$ ,  $a c$ , the base  $a b$  being the internal span between walls. The level  $d$  of the internal plinth (see the transverse section) is the base of the operations. The face being the vertical  $e$  (the axis of the little columns of the arcade), the equilateral triangle  $e f g$  was erected on the base, of which  $e n$  is  $n f$ . The sides of these equilateral triangles were prolonged indefinitely. The horizontal line  $i k$  being given as the level of the sills of the great windows, on the base  $i k$  equal to  $n e$  was erected the second equilateral triangle, of which  $l$  is the vertex. This vertex gave the height of the springings of the vault. The side  $g f$  prolonged gave at  $m$  the crowns of the arches of the windows. For the lower chapel the axes of the isolated columns are found erected at the two ends of the base of the equilateral triangle, one side of which is  $n c$ . From the level  $p$  (impost of the low vaults) and of the axis of the columns, the intersection of the line  $p q$  with the prolongation of the side  $f e$  gave the crown of the windows of the lower chapel. The sides  $f m$  prolonged served to place the upper pinnacles. The slope  $r s$  of the roof is likewise drawn at an angle of  $60^\circ$ . Thus for the transverse section as for the plan of the first story, the equilateral triangles generated the proportions.

The same method of drawing was observed externally. If we take two bays of the S. Chapelle of Paris, we see (Fig. 5) that the axes of the buttresses being given at  $a$ ,  $b$ ,  $c$ ,  $a c$  being taken as base, the equilateral triangle  $a c e$  was erected, which gave the level of the sill course of the windows. The prolonged sides of this triangle laid on each bay gave a ser-





series of lozenges of all heights; those of the imposts and crowns of the window arches, that of the upper cornice g, that of the pinnacles h. As for the gables of the windows, drawn as triangles with sides below  $60^\circ$ , the equilateral triangle is still recalled by the level of the astragal i of the upper cross flowers. In this edifice the unity of proportions is thus obtained by means of the use of equilateral triangles. Constant ratios are established between the parts and the whole, since the eye finds all the principal parts placed at the vertices of similar triangles.

These methods allow rapid drawing, always established according to the same principle for each edifice. In fact the architects who attempt today to erect structures according to the so-called Gothic method, if they wish to follow their feeling (as habitually practised), to compose without the aid of a geometrical method, soon find themselves stopped by innumerable difficulties. Not knowing on what bases to operate, they proceed by a series of trials, without ever finding either happy proportions or reassuring conditions of stability. It is certain, that if the masters of the middle ages had thus composed in uncertainty without fixed methods, not only would they never have been able to find time to construct such a great number of monuments, but also would not have obtained that perfect unity of appearance, which charms and still surprises us today. On the contrary, starting from this principle of locating and proportioning by means of triangles, they could very rapidly establish the great general lines with the certainty, that the proportions are deduced thereby, and that the laws of stability are satisfied. Yet this is not to state, that the feeling of the artist should not intervene, for one could apply these methods according to combinations infinitely varied. The S. Chapelle of Paris and the cathedral of Amiens are evidently drawn by artists of uncommon worth: but besides these monuments, there are others where the principle of the use of triangles, although adopted, has been but imperfectly done, and consequently where the proportions obtained are vicious. We have a striking example in the drawing of the cathedral of Beauvais. This great monument, that presents such beautiful parts, a plan so broadly conceived, gives in section and consequently on the exterior, ungraceful proportions by forg-





forgetting one of the conditions of its drawing itself.

Contrary to the method adopted in the 13<sup>th</sup> century, the entire system of the cathedral of Bourges is derived from the right-angled isosceles triangle and not from equilateral triangles. This was a remnant of Romanesque traditions, still very powerful in that province. The plan of the nave, some bays of which we present (Fig. 6), is derived from a series of right-angled isosceles triangles. The principal nave gives squares with two bays in pairs. As for the double side aisles, they were likewise produced by extending the sides of these triangles; but in the fear of exerting too active thrusts on the piers of the central nave, the architect has set the second row A of the piers within the axes a, so as to diminish the width of the side aisle. The centres of the crowns of the vaults of the first side aisle are thus transferred to b, and the centres of the vaults of the second side aisle to c. Taking the line e f as half the base, the architect (Fig. 7) erected the half of the great right-angled isosceles triangle e f g, whose sides by their intersection with the piers gave the levels n of the band of the triforium of the great side aisle and of the abacuses of the capitals i of the side aisle. Drawing a horizontal line from the apex g, the intersection of this line with the vertical axis of the piers of the second side aisle at k gave the base of a second right-angled isosceles triangle, whose half is g k l. The point l fixed the crown of the transverse arch and consequently the height of the nave. To be logical, the point l should have given the level of the base of a third right-angled isosceles triangle o p q, whose vertex q would have been the crown of the transverse arch of the high nave. Thus the distances between the extreme axes w would have given the base of the first triangle, the distance between the intermediate axes the base of the second, and the distance between the internal axes the base of the third. Thus would be obtained a perfectly harmonious proportion; while the vertex of the second triangle having given the crown of the transverse arch, there results from this a crushing of the upper part of the edifice, which destroys all harmony. The high windows appear too short by half, and the great side aisle is much too high in proportion to the height of the great nave. We are much disposed to think that this method was only





adopted as a means of rapidly terminating the edifice, the resources then beginning to fail, and that the primitive project gave the proportions indicated in our Fig., which are the natural deduction from the system employed. A fact strengthens our opinion; the upper flying buttresses drawn at m (the existing flying buttresses, and that are the only ones dating from the primitive construction of the nave) appear to have been rather arranged to abut the vaults C than the vaults D. However that may be, that there was a change or reduction of the primitive project, the interior of the cathedral of Beauvais is in bad proportions, and that is because the method adopted has not been followed rigorously in its consequences. One cannot say as much of the interior of the choir of Beauvais, which was a masterpiece before the changes that the 14th century made in the primitive arrangements. All parts in this vast edifice are based on an equilateral triangle from the plan of the entirety, and the details of the sections and elevations. Unfortunately the cathedral of Beauvais was erected with too moderate resources and weak materials, both in quality and height; disorders caused by the bad execution required works of renewal and strengthening, the doubling of piers, which in great part destroy the truly prodigious effect produced by this immense interior, so well conceived theoretically, and drawn by a man of genius. In spite of its beautiful proportions, the church of Notre Dame of Amiens is inferior to what remains of the cathedral of Beauvais, and that of Cologne built some years later on a similar plan and sections, is very far from presenting such happy arrangements. There at Cologne the architect has rigorously followed the geometrical principles; his composition is a formula that takes into account neither perspective effects nor the deformations apparently suffered by the curves, because of the height at which they are placed. Thus the choir of Cologne surprises more than it charms; the geometer has suppressed the artist. It is no the same at Beauvais, nor in any one of the good edifices of the French Gothic period: the artist is always present beside the geometer, and at need he knows how to soften the formulas. M. Boisseree, in his monograph on the cathedral of Cologne, has perfectly emphasized the use of the equilateral triangle in the construction of that edifice. But the learned archaeologist





does not seem to us to have thoroughly studied our monuments of the preceding period. M. Felix de Verneilh has noted some errors of M. Boisseree concerning our cathedrals, notably in what relates to the dimensions of Notre Dame of Amiens; but on the other hand, M. Felix de Verneilh has not attached to these geometrical methods the importance that they merit. "To draw a plan according to the principle of the equilateral triangle is a forced idea like any other; but was it in the thought of the master of the work? It is a restraint rather than a source of harmony; was the master of the work embarrassed by it? Our great artists of the 12<sup>th</sup> and 13<sup>th</sup> centuries, as attested by their monuments, were directed by experience and not by theories in the creation of the pointed style. Men of good sense before all, they had only one rule or principle; to attain the greatest effect with the least possible cost, avoiding the faults and appropriating the successes of their predecessors. The architect of Cologne, who followed them directly and imitated them so closely, would he already become so strong in mystic architecture? For our account, we have much difficulty in representing it to ourselves, and we should voluntarily think that this science, affected and useless, came to the world too late, for example in the 15<sup>th</sup> century with freemasonry, when the architects no longer had only to refine and subtilize everything." We have cited this passage from a pen of authority, because it tends to establish a certain confusion in the study of the art of the middle ages, and that it supports an injurious prejudice, in our opinion. Geometry and its applications are not a science useless to architects, and it is not a forced idea to use a geometrical figure to establish harmonious figures in architecture. We shall even say that it is impossible to conceive and develop a harmonious system without having recourse to geometric figures or to arithmetic. The Egyptians and Greeks did not proceed otherwise, and good sense can indicate no other methods of procedure. It is not doubtful that the architect of Cologne and his successors in France and Germany refined on the systems of their predecessors, but we have just demonstrated that they possessed them, and it was not possible to erect such monuments without possessing them. A geometrical or arithmetical system suitable to establish laws of proportions, far from





being a restraint, on the contrary is an indispensable auxiliary, for it may well serve as a rule, compasses and triangle in expressing our ideas. We cannot establish an edifice by the aid of a vague and indefinite empiricism. Let us also say, that in the productions of the human mind, rules have never been a restraint, except for ignorant mediocrities; they are an efficient aid and a stimulant for the minds of the elect. The very severe rules of musical harmony have not prevented the great composers from producing masterpieces, and have not stifled their inspirations. It is the same for architecture. The merit of the architects of the middle ages is to have possessed such definite rules, to submit to them and use them. A misfortune in the arts today, and particularly in architecture, is to believe that this art can be practised under inspiration of pure fancy, and that one erects a monument with that very vague principle that it is desired to call taste, just as one composes a woman's dress. Our masters of the middle ages were more serious, and when they laid the rule and triangle on their drawing boards, they knew how they were to proceed; they progressed systematically, geometrically, without passing their time in sketching at hazard, while awaiting this vague inspiration, that idle minds are accustomed to make a religion.

Note 1. p. 549. See *Cathédrale de Cologne*, by M. Félix de Verneilh. (*Annales Archéol.* 1848).

Besides the use of these geometrical methods was not an invariable formula, we repeat, it was a means suitable for obtaining the most varied combinations, but those were derived from a principle, that could not be mistaken without falling into falsity. Let us then see how the architect of the choir of Beauvais undertook to establish his plan and elevations.

Fig. 8 gives a portion of the choir of the cathedral of Beauvais, the axis being at A. First the axes of the principal piers supporting the high nave were fixed at 46 ft. apart. At a point a taken on one of these axes was drawn a line at  $60^\circ$ , which gave the point b by its intersection with the other axis, the centre of a pier like the point a. Drawing from the point b a perpendicular to the axes, there is obtained the intersection c, the centre of a third pier. Thus were fixed the centres of the piers. By always proceeding the same and prolonging





the lines at  $60^\circ$  was obtained a series of equilateral triangles, that gave at their vertices the axes C of the intermediate piers of the double side aisle and the external face D of the wall of the side aisle. The diameter of the cylindrical nucleus of the piers of the high nave has been fixed at 4 ft., and that of the intermediate piers at 3 ft. 4 ins.; the thickness of the wall D at 4 ft. Thus were established the axes, the spacing of the piers and the widths of the side aisles. Geometry alone has so far intervened. By his method, he is confident of having established harmonious relations on the horizontal plane. In fact one condition of harmony in the matter of architecture is to avoid the direct appearance of equal divisions, yet to cause these ratios to be established. By means of this drawing the spacings of three piers of the choir are equal, but those distances are more than half the span of the nave. The axes of the piers a and e are spaced apart more than half the direct distance c b between the axes, while the axes of these piers a and c are spaced apart half the diagonal a b. There is then a relation and a dissimilarity. Likewise the axes of the piers a and d are less far apart than the axes a and c, but between them is a distance equal to half that between the axes a and e. The spacing d f is less than the distance a d. So that if lengthwise the bays are similar, they are dissimilar in a transverse direction, diminishing toward the sides. That also conformed to the rules of stability, for it was important to reduce successively the thrusts in approaching the outside.

But this choir opens on a transverse aisle equal in width to the great nave. The architect, artist and practitioner feel that the great archivolts turned from the piers a and c will exert an active thrust on the first pier g of the choir, that is no longer shored at the height of those archivolts. He first increases the section of that pier; and then diminishes the span of the first bay B.

Not only does he thus submit his drawing to a law of stability, but he satisfies the eye by giving more strength to the angle pier and less span to that first bay. He reassures the eye, just as the Greeks did, when they reduced the last intercolumniation at the angle of a portico, and increased the diameter of the corner column. At G on the bay of the transver-





transverse aisle, this architect intends to erect a tower; he reinforces the piers h and i as we have drawn. This method applied in the horizontal plane gives the means of tracing the arches of the vaults according to harmonious relations. Thus for the transverse arches, the architect divided the base in 4 parts and has taken 3 of these parts for the height of the rise i j; for the diagonal arch, he also divided the base m f in 4 parts, and took 2.5 parts for the rise n o; it results from this that the rise n o equals the rise i j within a few inches. Two of the last parts served as base f n of the side arches, whose centres are f n, and thus enclose an equilateral triangle; for one will observe that the base n f equals the side f p, the horizontal projection of a side arch. On its horizontal plane the architect established thus all the harmonic relations of the parts, the arches of the vaults, and only had to proceed by an analogous method in vertical projection, for the ratios of rises and spans to be established. Taking o one bay c a in elevation (Fig. 9), and drawing from the axes of the piers equilateral triangles forming a series of lozenges, the vertices a gave the level of the imposts of the archivolts of the side aisles; the vertices b of the triangles w with base taken at the height of the astragals c of the little attached columns gave the level of the lower band of the triforium; the intersection of the vertical lines d with the sides of the triangles, the level e of the upper band of the triforium; the vertices f are the level of the imposts of the great vaults, and the points of intersection g, the level of the imposts of the side arches. It results from this drawing that the height h p (the operations are always made above the bases) equals the width of the great nave between the axes of the piers. (See the plan); that the height b k of the triforium equals the height p b, that the height b f equals the height h p, or the width of the nave between axes; yet by the shifting of the triangles at c, there is a difference b o which prevents the eye from divining these exact ratios, that would be offensive; every harmony of proportions requiring, as we stated above, ratios but not similarities. One also verifies that the line m n equals the base of the triangle; i.e., to the distance between the axes of the piers of two bays,





which gives the appearance of stability to the pier, so to speak, stayed by those imaginary sides, that the eye traces *w* without taking them into account; that the archivolts at *s* are tangent to the prolongation of these sides; that likewise the capitals *i* that support the great vaults are shored by the *s* sides *j*, *i*. If we could follow that composition into all its details, we should see that this principle is applied in the drawing of the triforium, the tracery of the windows, etc.

If we now take an edifice having only one vaulted aisle, like the hall of the synod of Sens, built at the same time as the choir of Beauvais, we shall see that the architect proceeded after a method similar to that just described. A quarter of one bay of that hall being represented by *A B C* (Fig. 10), the vault is first traced; i.e., on the horizontal projection *A C* of the diagonal arch was drawn the semicircle *a b*, which is the revolved half of that arch; taking on the half diameter *a C* a distance *a d* equal to half the base of the transverse arch, and erecting a perpendicular *d e* to the line *a C*, the point of intersection *l* gives the crown of the transverse arch, and *a e* is its curve; then *d e* is the rise of this transverse arch. From the level of the base *f g*, of the piers, erecting an equilateral triangle *f g h*, and on the vertical dropped from the vertex taking a length *h d* equal to *e d*, the point *d* gave the level of the imposts of the arches of the vaults, and the proportions of the hall were thus established. For a drawing of the windows that close the end of the hall, he proceeded by means of equilateral triangles, as indicated by the side *i K*. These ratios of proportions have been established between these windows of the hall itself.<sup>1</sup> Beneath the great hall of the synod of Sens exists a ground story vaulted on a row of columns. The procedure employed for establishing the proportions of that interior is the same as that just indicated, and our Fig. 11 will relieve us from a new explanation.

Note 1.p.555. Art. Solle.

These examples suffice to demonstrate that a harmonic system of proportions was adopted by the architects of the middle ages in the composition of their edifices, a system that proceeded from the interior to the exterior. This system essentially differs from that of the Greeks, which proceeded from the exterior to the interior and by numerical ratios; but one





cannot deny that it is logical and according to the laws of statics. It is then not to compare these systems and to desire to apply the methods of one to the other; one can only study them separately. Because the Greeks invented the orders and gave them excellent proportions, one cannot conclude from this fact that there cannot exist another principle of proportions; and if the column in the architecture of the middle ages is not subject to the laws of proportion, that control the Greek column, so that it longer has only relative proportions instead of possessing absolute proportions, one cannot conclude from this that Gothic architecture is without any principle of proportion, as M. Quatremere de Quincy has done. In Romanesque and Gothic architecture, the column is no longer a support destined to sustain a lintel; it is a member receiving the arches of the vaults; its function no longer being the same. Instead of being a principal object in architecture, it is only an accessory object, that is subject to the general laws of construction and to the proportions on which that is established. But on this point, as on many others, when it is necessary to compare the arts of antiquity and those of the middle ages, men begin with a mistake; just as well say that the French language is not a language, because it has a syntax different from Greek syntax, or that a horse is a deformed animal because his organization essentially differs from that of a swallow. In our opinion, this is to reduce the field of studies, and to singularly lessen the resources of the art that pretends to restrict the human mind to a single comparison between Grecian art and the art of the middle ages, it is first necessary to impose on a Greek architect the programme, that was given to the architect of the cathedral of Beauvais, and to see how by the aid of those elements he could satisfy it. Now the programmes given in our days sensibly approach to those imposed on the architects of the middle ages; more than those given to the Greek architects, and one can scarcely conceive how to satisfy them, either by material means or by the forms of art, that one should rather resort to Greek architecture than to that adopted by the artists of the middle ages; and for what reason should be suppressed that order of human works, which supply elements applicable in all points of view?

But <sup>in</sup> another part of this work, <sup>1</sup> we have emphasized the no

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less great dissimilarities between antique architecture and that of the middle ages; we have shown that if the architects of Greece and Rome subjected the parts of their edifices to the module, i.e., to a system of proportions dependent on art alone, the architects of the middle ages took into account the human scale, i.e., the dimensions of man. That is a capital point and must necessarily establish a new element in the system of proportions. In fact, bases, capitals, diameters of columns, mouldings and bands, window sills, according to the rules of the artists of the middle ages must quite at first recall the human height, whatever the dimensions of the edifice. This was a means of presenting to the eye the true dimensions of the monument, since thus was established in all parts an exact ratio to man.<sup>2</sup> We admire as much as any person the principles of proportion that governed Greek architecture, but we do not think that those principles are the only ones admissible; we are indeed compelled to recognize the existence of a new mode of procedure by the masters of the middle ages, and in studying it cannot mistake its importance. The Greeks admitted the power of numbers; this was a religious principle among them, so to speak. Odd numbers and their multiples dominate, 3, 7, 9, 21, 49; but they did not take into account the human scale. they established a perfect harmony by the aid of these combinations of numbers. That is certainly admissible and merits even more attentive study on the part of those, that pretend to possess a monopoly of the knowledge of this art (although they are satisfied to continually study the products, without ever deducing from them a philosophical system, let us say); but besides or as a result of that very interesting arithmetical method, there is the geometrical method of the middle ages, and the intervention of the human scale, which have a certain value and cannot be disdained.

Note 1.p.557. Art. Echelle.

Note 2.p.557. The exposition of this principle, so true and so simple, has appeared to establish an actual heresy in the eyes of some critics; we confess that we do not understand why. That this principle differs from that adopted by the Greeks is not doubtful; but in what would it be contrary to the conditions of the art of architecture? That is what men have not taken the trouble to discuss.





We have so far presented in this Article only examples taken from religious monuments; yet it is unnecessary to conclude that the architects of the middle ages did not think of proportions, when they erected civil edifices. Far from that; we see them follow their principles of proportion by the geometrical method in monuments of public utility; in houses and even in defensive works; for they did not think that a tower would be defended worse against assailants because established in happy proportions. And in that we do not hesitate to give an artist's brevet to those masters too much scorned. Certainly it was easier to proportion a monument by combinations of numbers, independently of the human scale, than to satisfy the eyes by observing the law of the human scale. Then combinations of numbers could no longer be applied, for it was always necessary to start from an invariable unit, the height of man, and yet to find harmonious ratios; one comprehends how in this last case, the geometrical method should be preferred to the numerical method.

Let us again take an example, this time from a civil edifice. The facade of the old hospital of Compeigne dates from the middle of the 13<sup>th</sup> century; it is a simple gable closing the hall of two bays. To put this facade in proportion (Fig. 12), the architect has used the Egyptian triangle, i.e., the triangle with base of 4 parts and perpendicular to the base has 2.5 parts. Not only is the inclination of the apex of the gable given by the sides of the triangle, but our Fig. shows that the lines parallel to these sides give the levels of the capitals a, bases b, capitals d, and the slope c; these sides are repeated at f above the upper windows and outline gables with no other reason than to recall the generating triangle; that the window arches g are inscribed within the sides of the triangles; that the eye sees the points n, i, m, n, all placed on these sides. The method being adopted, for example, the architect established a geometrical relation between the long windows of the ground story and the doorways, as indicated by the sketch A. Then the eye finds on that entire facade points placed on the inclined lines parallel to the sides of the generating triangle. There result naturally from the ratios a series of harmonic deductions, which constitute an actual system of proportions. Let us add that on this facade, as





in all architecture of the middle ages, the human scale is the starting point. The buttresses are 3 ft. wide; the plinth is profiled at 4 ft. above the ground; the doorways are a fathom in width, etc.

If one takes the trouble to apply this method of using triangles as a means of placing edifices in proportion, in all monuments of the middle ages having some value, one will always find that they proceeded by logical drawings, establishing harmonious proportions by parts and lines parallel to the sides of these triangles, and marking to the eye points that recall these lines inclined at  $45^\circ$ ,  $60^\circ$  or at  $52^\circ$ .

If instead of following without examination or analysis traditions, whose principles we no longer seek to discover, we should assume confidence in the use of reasoned methods, we could derive a system from these examples of the architecture of the middle ages and employ them, not to flatly imitate them, but to extend or perfect them. We should perhaps arrive at establishing a harmonic system of complete proportions, when we possess none, and leave ourselves to chance, or to what we call feeling, which is all one. No one will dispute that the Greeks were endowed with a delicacy superior to our own. On every art question, if those men, being placed in an excellent atmosphere, believed it necessary to resort to arithmetical laws when they desired to put an edifice in proportion, and did not trust themselves to that capricious and variable inspiration, that we decorate by the name of feeling, how shall we, equipped only with ruder senses, have the pretention to recognize no law and proceed by chance, or to believe that we follow the laws established by the Greeks, when we can no longer interpret their sense, limiting ourselves only to producing their letter? Measuring the Parthenon a hundred times with differences of a few 16ths of an inch, of what use will be this compilation of documents, if we do not know how to deduce the generating principle of the proportions? Just as much use in copying a hundred times a text whose meaning remains unknown, limiting one's self to imitating with more or less material accuracy the forms of the characters, the accenting and the interlineations. Left to themselves and far from the examples left by antiquity, the artists of the middle ages have gone farther than we in seeking and finding a logical principle of proportions, and in k





knowing how to apply them. Then it is not an advance to ignore those principles; it might be one to know them and to find others more perfect. But we can never accept as an advance the ignorance of an earlier fact. On the contrary, progress only results from the knowledge of preceding facts with a more just appreciation of their value and a better application. That good sense revolts at the idea of employing today in architecture forms adopted by the civilizations of antiquity or of the middle ages is natural; but what sensible mind would dare to pretend it necessary to ignore, to leave in oblivion the results obtained before us to produce a work superior to those results?

If the harmonic system of proportions adopted by the Greeks differs from that accepted by western architects of the middle ages, the bond connects them. Among the Greeks, the harmonic system is derived from arithmetic; from geometry among the western men of the middle ages; but arithmetic and geometry are sisters. In these two systems is found the same element: ratios of numbers, ratios of angles and dimensions given by similar triangles. But to copy Grecian monuments, without knowing the numerical ratios by which they were put in proportion, and the logical reason for those ratios, and set at naught the geometrical method invented by the men of the middle ages, cannot be the means of obtaining this progress of which we say much, without your seeing it developed.

It would be more sincere to recognize that in the matter of the principles of architecture today, we have all to learn from our predecessors, from the art of construction to those grand harmonic methods of antiquity or of the middle ages. For wise conceptions, profoundly reasoned, men have substituted a sort of rude empiricism, that consists either in imitating earlier forms without understanding them, or in combining them without order or reason, thus producing actual monsters, which inspire one with disgust and weariness, when the first astonishment is passed. When these chimeras are offered to us as progress, the future will do justice to them, and will see only confusion and ignorance in these degenerate products, only piled up by the aid of powerful means and enormous expense.

We firmly believe in progress, we verify it joyfully within our modern society; we are not of those skeptics, who admit





that in this world good and bad are always distributed in equal parts. But it is in this time, even in our advanced civilization, where reason meets repulses; now in what concerns our art, we are in one of those periods. Is it to be believed that all is lost? Certainly not; our art will recover by the aid of these historical studies, very badly seen by some, but which are preserved in spite of all, will be continued, and will produce fruitful results. Let us learn to know better the arts of ancient times; patiently analyzing them, we shall have established the foundations of the arts in our age; we shall recognize that besides material facts, which constantly differ, there are invariable principles, and that if history arouses curiosity, it also unveils, for those that know how to probe it, treasures of knowledge and experience, that the intelligent man must employ.

#### PULE. Balcony.

An old word equivalent to the modern word balcony. (Old French poem).<sup>1</sup>

Note 1.p.561. Gilles de Chin, romance of Goutier of Tournay, 14th century. Verse 477 et seq.

It is very rare to find balconies in Paris on houses of the middle ages arranged like ours. Projections on facades allowing one to jump down into the public street or the area of a court are generally covered; these are then galleries or loggias. (Arts. Breteche; Loge).

#### PUITS. Well.

A cylindrical hole sunk into the ground to reach a layer of water. Wells are either cut in the rock or are lined internally with masonry to keep out the earth. They are crowned at the level of the soil by a curb of cut stone, serving as a parapet, and terminated at their lower part by a wooden wheel that served for their construction, and which remains permanently below the level of the layer of water.

The constructors of the middle ages proceeded just as we do to dig a well. Excavating a cylindrical hole, they placed in it a wheel of oak, on which was built a wall like a round tower. Gradually excavating under this wheel, that sunk with the masonry that it supported; as the wheel sunk, they extended this





cylindrical masonry in the upper part.

There still exist a great number of wells of the middle ages in our old cities, in castles, cloisters, palaces and houses. They are lined with cut stone; their diameters are quite variable. There are wells with only 3 ft. diameter inside, and others with even 12 or 18 ft.

Nearly all churches possess a well, either sunk in a crypt or a side aisle. These wells were originally dug for the needs of the constructors; the edifice being completed, a curb was placed at the opening, and they were reserved for the service of the worship. Most cloisters of monasteries were provided with a well, when the location did not permit of fountains at the level of the ground. The curbs of those wells are cut with care, often in a single block of stone, and decorated by sculptures. The water was drawn by means of a bucket suspended by a rope running over a pulley; the suspension of the pulley became an ornamental motive, sometimes very happily conceived. The bucket for raising the water was fastened to the rope, and to pour the water into a pail that could be carried, there was frequently cut on the curb a sort of channel with a gargoyles. One still sees those curbs in our cloisters or old palaces. <sup>1</sup> Fig 1 presents one of them belonging to the 13<sup>th</sup> century.

Note 1. p. 563. There exists a very beautiful one at Sens in the storerooms of the palace of the archbishop.

On the squares of cities were dug large wells, if the location did not permit the establishment of a fountain. One of the most remarkable works of this kind is the principal well of the city of Carcassonne. This well is bored through an enormous bed of sandstone, and most probably dates from very high antiquity. Its internal diameter is 8.4 ft. The actual depth is 99.2 ft. The water layer sometimes rises to 20.7 ft. deep, but it is often dry and is partly filled up. An old tradition claims that before abandoning Carcassonne, the Visigoths cast into this well a part of their treasures; but excavations made at different times, and particularly recently, have raised from the cavity only a bucket and some rubbish without value. This well is now crowned by a sandstone curb, whose arrangement is curious. The sandstone base is 3.3 ft. high and 8.7 ins. thick, supports 3 marble piers joined at t





their tops by 3 beams (Fig. 2). From each beam was suspended a pulley. Thus three persons could draw water at the same time. At A is drawn the plan of the well; at B is its elevation.<sup>2</sup>

Note 2.p.563. *Histoire des comtes de Carcassonne* by Besse. (Carcassonne. 1845). See the verses in dialect on the marvels of this celebrated well. According to the poet, the depth of this well attained no less than the centre of the earth.

In a small square in the same city exists another well likewise cut in the rock, but of smaller diameter, whose curb and the suspension of the pulley merit mention. We give the plan at A (Fig. 3), and at B the elevation of this monument, which like the preceding one dates from the 14 th century. Here the cross beam connecting the two piers is of a single piece of sandstone. We have sketched at C the detail of the bases of the piers in the same pieces with the pilasters penetrating the curb, so as to prevent the overthrow of the two monoliths. The depth of this well is 70.5 ft. and the water depth is 11.5 ft.

Men did not always have at command materials resistant enough to allow the use of piers and crossbeams of stone of such small sizes; then the part required for attaching the pulleys was made of iron and fixed on a curb of cut stone. There yet exist in some cities of France wells that have retained their iron fixtures of the 15 th and 16 th centuries. (Art. Serrurerie).

If wells placed outside on the public roads were very simple, those opening in churches or cloisters were often very richly ornamented. Their curbs and the supports of the pulleys became motives for decoration. There formerly existed in the side aisle of the cathedral of Strasburg a very rich well cut in sandstone. Its curb was hexagonal in plan. On three sides rose three piers supporting three lintels uniting at the centre of the hexagon (see plan A, Fig. 4), supporting at their junction the pulley attached to a pendant. The three lintels were decorated by arches with rosettes and cusps. A cornice crowned these lintels. (See elevation B).

The curb rested on a step C surrounded by a projecting gutter D, to prevent water dripping from the bucket from flowing over the pavement of the church.<sup>1</sup> This well dated from the 14 th century, and was only removed during the last (18 th) century.

Note 1.p.567. We possess a drawing of this well, that is further represented in an old engraving representing the interior of the cathedral of Strasburg.





Many crypts possessed wells, the water of which often passed for miraculous. A very old one is still seen in the crypt of the church of Pierrefonds (priory), whose water is said to heal intermittent fevers.

It is scarcely necessary to state that the keeps of castles were equipped with wells dug and lined with the greatest care. The keep of Coucy has its well, very large and deep (Art. Donjon).

A great wheel with windlass served to raise the bucket. In one of the towers of gate Narbonne at Carcassonne (that on the right in entering the city), there exists a very large well in the middle of the lower hall, but not deep, the water being but a few yards below the top of the ground. The curb of this well rises little from the pavement, and is only a circular capital with spout. Several persons may thus draw water and very rapidly fill a cask or great vessel. Many other towers of the city of Carcassonne possess wells. That of S. Nazaire has one with two openings, one at the level of the exterior, the other at the level of the second story. (Art. Tour). In the buildings of the 13<sup>th</sup> century of the abbey of Chateau-Landon is still seen a well 3.4 ft. diameter, arranged so as to serve several stories, as indicated by section C. (Fig. 5). This well with plan sketched at A is included in a buttress projecting on the exterior of the building. The raising of the bucket is only done at the story B (see section C) by means of a wheel and windlass. There are still seen at a and a' square holes made in the stone, or rather made in the height of a course, that served to pass the rotating axis of the windlass into the middle of a wooden block, well squared and 9.8 ins. square. The rope of the well took one or two turns around the drum of the windlass (see plan A and section D), the buckets were suspended from two oblique pulleys e fixed at g in the upper part; so that by turning the wheel in either direction, the buckets were raised to the level of one of the two stories, where they were stopped by a man charged to receive the contents. This very simple mechanism is indicated by the plan A' and by the section D.<sup>2</sup>

Note 2.p.567. We owe the drawing of this well to M. Boudot.

In the courts of houses of the middle ages in Paris are still found wells of quite elegant form.

The little service court of mansion de la Tremoille at Paris





possessed one with a curb or beautiful curvature. These wells were often set against kitchens or stables, and the pulley was then suspended from a projecting corbel built in the masonry above the curb. These corbels represented animals holding between their paws the pulley, or indeed half arches with cusps, rosettes, etc. The well of the palace of the dukes of Burgundy at Dijon still has the support of the pulley, representing a lion issuing from the wall. Wells are often charged with shields of arms, emblems, devices and inscriptions.

Here (Fig. 6) is a pretty well, still entire, in the court of a house of the little city of Montreal. The curb is externally octagonal and circular inside. Two pieces fixed on two sides of the octagon (see plan) support a stone lintel from which the pulley is suspended. On one pier <sup>is seen</sup> a shield with orle and charged with a squirrel (see detail A), and below is a little cartouche on which is engraved the following inscription; "John of Brie made me in the year 1526." Were it not for this inscription, a much earlier date could be assigned to this well, for it has all the characteristics of the beginning of the 15<sup>th</sup> century. (See profiles B).

The Renaissance excavated wells, whose curbs are frequently sculptured with much art and refinement; very beautiful ones are seen at Troyes, Orleans, Sens, Tours, etc.

In Article Serrurierrie we shall have occasion to mention beautiful wrought iron equipment for wells.

*End of 2<sup>nd</sup> Volume.*





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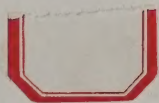


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